Effects of dietary DL- Methionine substitution with Piridoxine on performance of broilers

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INTRODUCTION

Methionine, which is the first limiting amino acid in most commercial feeds and the most likely nutrient to be marginally deficient, has been shown to be important in antibody production to the point that the broiler's methionine requirement for optimum immunity is higher than the requirement for growth or feed conversion. Pyridoxine has been shown to be essential for the growth of chicks by several investigators (Carter and O'Brien, 1939; Jukes, 1940; Hegsted et al., 1954; Hogan et al., 1941). An understanding of the mechanisms through which nutrition influences the immune system is necessary to appreciate the many complex interactions between diet and infectious diseases. There is some evidence that essential amino acids levels in the feed higher than NRC specifications needed to achieve optimal growth performance, immunocompetence and disease resistance (Kidd et al., 2001; Quentin et al., 2005). Transamination activities of DL-methionine are similar to pyridoxine.
We have, therefore, attempted to investigate the substitution possibility of some of dietary DL-methionine with pyridoxine.

Materials and Methods

Three hundred one-day-old broiler chicks of commercial strain (Ross 308) were randomly assigned to 5 dietary treatments (M_c, $M_{0.95c}$, $M_{0.90c}$, $M_{0.85c}$ and $M_{0.80c}$) with 4 replicate pens of 15 chicks each one. Control group (M_c) was fed a complete feed mixture with sufficient dietary methionine and without pyridoxine supplement. Other groups were fed the same diet except that their methionine levels were 0.95, 0.90, 0.85 and 0.80 % of Mc group respectively. The diets methionine deficiencies substituted by addition of $20_{mg/kg/\ day}$ pyridoxine to them. The treatments were carried out for 42 days.
Each pen was one square meter and covered with wood shaving the house temperature was initially maintained at 32◦C and reduced 2.8◦C every week to reach a constant temperature of 20-22◦C at 28 day of age, a continuous lighting was used for the first 3 days and a 23:1h light: dark cycle was applied for the rest of the experimental period. Birds were allowed free access to the feed and fresh water throughout the experiment.
Diets were formulated according to the recommended nutrient by Ross 308 manual for broiler chicks and were offered in mash form. The composition of the basal diet and experimental diets is shown in table 1. The starter, grower and finisher diets were provided similar nutrient and fed *ad libitum* from 1-10, 11-28 and 29-42 days of age, respectively.

Table 1. *Composition of the basal diets (g/ kg)*

	Starter(0-21d)		
	Starter	**Grower**	**Finisher**
Ingredients			
Corn	598.4	620	648.6
Soybean meal (440 g/kg CP)	357	328	285
Soy oil	0	10	25
Di-Ca-Phosphate	17	16	15.5
Oyster shell	15.3	15	14.8
Sodium Chloride	2	2	2
Vitamin and Mineral premix [a]	5	5	5
DL- Methionine	Variable[b]	Variable[c]	Variable[d]
Hcl-Lysine	2	1.9	1
Sodium bicarbonate	1	1	1
coxidiostate	0.5	0.5	0.5
lincomycine	0.3	0.3	0.3
Calculated analysis[f]			
Metabolisable energy (MJ/kg)[g]	2884	2967	3064
Crude protein(%)	20.73	19.6	18
Calcium(%)	0.92	0.88	0.85
Available Phosphorus(%)	0.46	0.44	0.42
Lysine(%)	1.3	1.2	1.05

Results and discussion

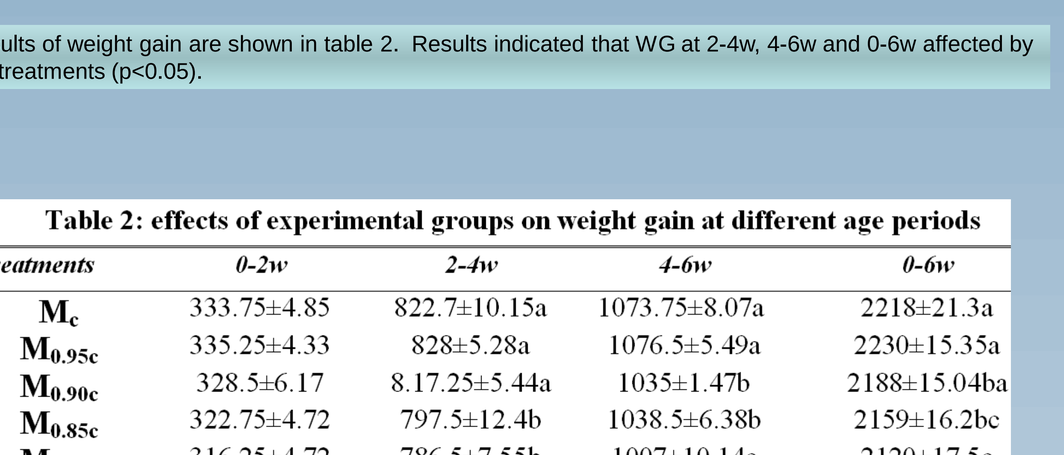
Results of weight gain are shown in table 2. Results indicated that WG at 2-4w, 4-6w and 0-6w affected by the treatments ($p<0.05$).

Table 2: effects of experimental groups on weight gain at different age periods

Treatments	*0-2w*	*2-4w*	*4-6w*	*0-6w*
M_c	333.75±4.85	822.7±10.15a	1073.75±8.07a	2218±21.3a
$M_{0.95c}$	335.25±4.33	828±5.28a	1076.5±5.49a	2230±15.35a
$M_{0.90c}$	328.5±6.17	8.17.25±5.44a	1035±1.47b	2188±15.04ba
$M_{0.85c}$	322.75±4.72	797.5±12.4b	1038.5±6.38b	2159±16.2bc
$M_{0.80c}$	316.25±4.72	786.5±7.55b	1007±10.14c	2120±17.5c
significance	ns	**	**	**

Data includes mean ± standard error of mean
Means within Columns with different subscripts differ significantly.
ns: no significant **: significant at $p<0.01$

Figure1: Effect of substitution of methionine with pyridoxine on weight gain(2-4w)



$M_{0.85c}$ and $M_{0.80c}$ treatments decreased weight gain compared to other treatments at 2-4w, 4-6w and 0-6w.

Figure2: Effect of substitution of methionine with pyridoxine on weight gain(4-6w)

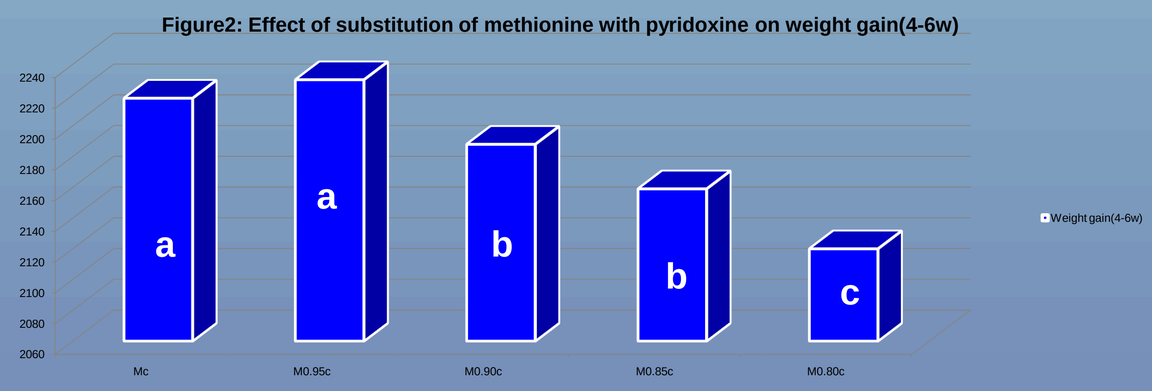
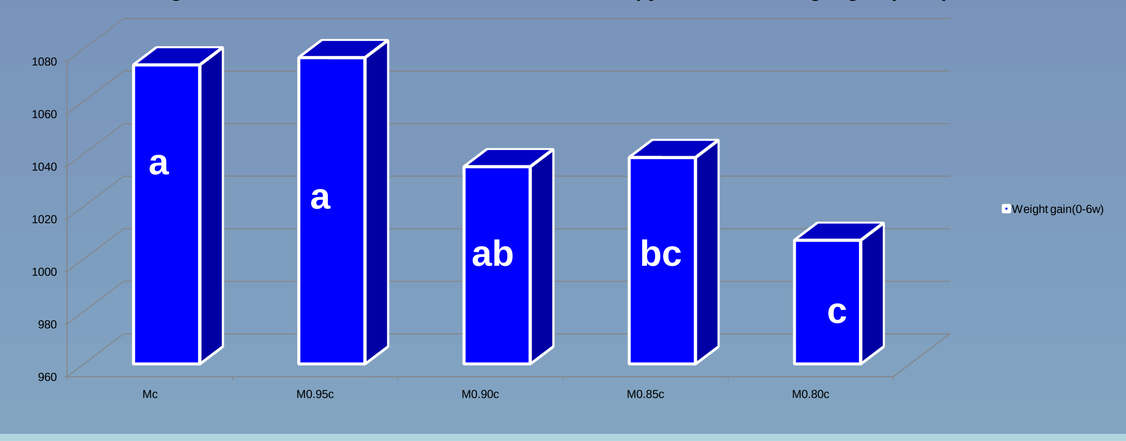


Figure3: Effect of substitution of methionine with pyridoxine on weight gain(0-6w)



As we seen in table 3 and 4, treatments haven't any significant effects on FI and FCR at any experimental periods (P>0.05).

Table 3: effects of experimental groups on feed intake at different age periods

Treatments	*0-2w*	*2-4w*	*4-6w*	*0-6w*
M_c	471.5±10.44	1358.25± 17.28	2250± 16.67	4079.75± 27.83
$M_{0.95c}$	473.5± 9.64	1362± 20.66	2240.75± 12.89	4076.25± 18.06
$M_{0.90c}$	470.5± 9.64	1353.75± 16.94	2225.5± 18.21	4049.75± 38.96
$M_{0.85c}$	468.5± 8.17	1341.75± 10.2	2227± 19.23	4037.25± 23.09
$M_{0.80c}$	460.5±13.76	1327.75± 7.85	2206.75± 17.46	3995± 34.59
significance	ns	ns	ns	ns

Data includes mean ± standard error of mean
Means within Columns with different subscripts differ significantly.
ns: no significant

Table 4: effects of experimental groups on weight gain/ feed intake(Feed conversion ratio) at different age periods

Treatments	*0-2w*	*2-4w*	*4-6w*	*0-6w*
M_c	1.41±0.034	1.65±0.029	2.12±0.04	1.84±0.029
$M_{0.95c}$	1.41±0.027	1.65±0.025	2.1±0.032	1.83±0.007
$M_{0.90c}$	1.43±0.018	1.66±0.018	2.14±0.029	1.85±0.019
$M_{0.85c}$	1.45±0.02	1.68±0.018	2.14±0.024	1.87±0.019
$M_{0.80c}$	1.46±0.022	1.69±0.011	2.17±0.017	1.88±0.002
significance	ns	ns	ns	ns

Data includes mean ± standard error of mean
Means within Columns with different subscripts differ significantly.
ns: no significant

Conclusion

we concluded that reducing dietary levels of Methionine by 80 and 85% of control groups have negative effects on weight gain and decrease it in all age periods (except 0-2w) but it is concluded that reducing of dietary Methionine by 95, 90, 85 and 80% of the control diets and addition of pyridoxine to compensate the methionine deficiency haven't any negative results on feed intake and feed conversion ratio .Thus we concluded that pyridoxine such as DL-methionine can act as a methyl donor and at most 10% of dietary DL-methionine can be substituted with 20mg/chick/day pyridoxine without any harmful effects on the broiler performance.

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