Evaluation of Supplement Fresh Liquid Whey to Drinking Water on Broiler Performance

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ABSTRACT: The present study was conducted at poultry farm of Kufa University, College of Agriculture, Iraq from 24\11\2007-8\1\2008 to evaluate the effects of adding different levels of fresh liquid whey on the broiler performance. A total of 240 Lohman broiler chicks were used in this study. Chicks were divided into four groups according to study treatments with three replicate for each one.

Fresh whey was mixed daily with the drinking water at rate 0, 2.5, 5 and 10%. The drinking water offered *ad libitum* from 1 to 49 days of age. Body wight gain of birds received 2.5 and 5 % whey were improved significantly at 49 days of age, while 10% whey reduced body weight gain significantly (P≤0.05) compared with control group at 33-49 days of age. Adding whey to water lead to significant (p≤0.05) improved feed conversion ratio during 20-49 days of age .The carcass weight in chickens received 2.5 and 5 percent whey was maximum (P≤0.05) at 49 days of age compared with control group. Gastrointestinal tract weight of chickens received whey was significant increased (P≤0.05) with increasing whey concentration. The 10% whey group where heaver weight among other groups. The present study indicate that 2.5and 5 percent whey in drinking water of broilers had beneficial effects on performance.
Key words: whey, broiler performance

INTRODUCTION

Many feed additives (probiotic, flavomycin) are routinely used worldwide as growth promoters to increase feed efficiency and growth rate of broilers. In the past, the major growth promoters added to the feed of broilers were antibiotics. However, the current research trend is to look for natural alternative to antibiotics because of the public concurrence of antibiotics resistant bacteria (Lee *et al.,* 2004).Whey or liquid remaining from cheese production is one of the most valuable protein source in human food chain. In spite of it balanced nutrients, liquid whey is disposed as a waste product (Thivend, 1978).

In 1986, the first international whey conference was conducted in USA. They pointed that, Whey is a high nutritional value by - product, a nutrient- rich protein source compared of four main protein fractions (Brunner ,1981). Dried whey that is produced from its liquid form can be used in chickens (Susmel *et al.,* 1995). For years, dried whey is used in monogastric nutrition (Balloun, and Khajaren.1974, Damron *et al.*, 1971).

It is shown that dietary supplementation of whey powder linearly increase body weight gain and nitrogen retention in turkey poults (Balloun and Khajaren,1974)and in broiler chickens (Al-Ubaid and Bird, 1964 Karmenshahi and Rostam, 2006). Dietary supplementations of dried whey to monogastrics significantly improved digestible protein fat and feed to gain ratio (Balloun and Khajaren 1974) and increases the absorption of minerals like Ca,P,Cu,Fe and Mg(Earl and Salim, 1982). Therefore, the objective of this study was to evaluate the effect of different whey levels in water on performance of broiler chickens.

MATERIALS AND METHODS

The experiment was conducted in poultry house located in poultry farm of Animal Resources Department, College of Agriculture, Kufa University, Iraq. The objective of this experiment was to evaluate the effect of fresh liquid whey which obtained from agriculture college cheese factory (Table 1) supplemented to drinking water on broiler performance from 1-49 days of age. Two hundred and forty day-old unsexed Lohman broiler chicks were divided into 4 groups with three replicates for each (20 birds/replicate) with $3m^2$ (1.5m×2m) for each replicate, distributed in different treatments at Complete Randomize Design (CRD).Birds reared for 49 days using the standard brooding practices, and good veterinarian vaccine program ,using of alive vaccines at one day old for IB and Newcastle disease by spry method (Ceva type) and then at seven days vaccinated by injection of oil vaccine (Inter Vet) for IB and Neacastle disease, at 12 days of age vaccinated with IBD vaccine (Tad Clon type).They reared on wood shaving litter. Feed and water were provided *ad libitum* in the brooding house and fed a commercial standard starter diet from 1 to 4 weeks and then finisher diet (Table 2).Four levels of fresh liquid whey were provided daily to the birds. It was mixed with drinking water at rate 0 , 2.5 , 5 and 10% the product whey were prepared every day and provided to the different broiler treatments throughout the experimental period . Body weight gain (BWG) and feed intake (FI) were recorded weekly throughout the experiment all period. Five broiler chickens for each group were slaughtered to measure carcass weight and gastrointestinal tract (GIT), gastrointestinal tract to carcass weight (GIT/C) at 49 days of age. Statistical analysis in this experiment was Completely Randomized Design CRD using SAS (SAS,2001). Different among treatment means were detected using the LSD Procedure of SAS (SAS,2001).

RESULT

The performance of chicken including body weight gain at 2, 3, 4, 5, 6 and 7 weeks of age are present in (Table 3) which appeared the levels of whey in water had no significant effect on body weight gain up to 3 weeks of age, but it increased significantly ($P \leq 0.05$) at 4 weeks in the group given 5 % of fresh liquid whey. Ten percent level whey had reduced body weight gain from 5-7 weeks and the body weight gain recorded less values than control group significantly ($P \leq 0.05$).

The overall body weight gain 0-7 weeks of age was significantly improved ($P \leq 0.05$) by adding 2.5 and 5% level of whey (Table 4).However, significant ($P \leq 0.05$) reduction in body weight gain was observed and reached to 11.4% comparing with control group.

Table (1). Chemical analysis of fresh liquid whey *

Element	Water (%)	Lactose (%)	Fat (%)	Protein (%)	Ash (%)	Solids (%)
Percentage	90.50	5.0	0.2	3.50	0.80	9.509

*from (Tariq, 2007)
Calculated on the basis of solid material.

Table (2). Composition of experimental diet

Ingredients and composition	Starter %	Finisher%
Yellow corn	35.00	40.00
Wheat	30.20	30.00
Soybean meal (44%CP)	22.50	18.20
Protein concentrate	10.00	10.00
Sodium chloride	0.40	0.40
Di Calcium Phosphate (2 Ca : 1 P)	0.40	0.40
Limestone	0.90	0.90
DL-Methionine	0.08	0.08
Vegetable Oil	0.80	-
Calculated Analysis* :		
Crude Protein %	22	20
M.E.(Kcal\Kg feed)	2950	2950

* according to the NRC (1994) specification

Table (3). Body weight gain (Mean ±SEM) measured weekly

Whey / Age week	Control	2.5%(g)	5%(g)	10%(g)
2	119 ±12.8	124 ± 15.1	121 ± 12	121 ± 106
3	227 ± 31.4	273 ± 27.5	279 ± 28.3	275 ± 13
4	437 ± 19.8	445 ± 21.4	501 ± 29.8*	430 ± 16.9
5	806 ± 25.7	810 ± 29.2	902 ± 32.5*	753 ± 25.4*
6	1210 ± 37	1248 ± 20*	1318 ± 29.3**	1066 ± 23.9*
7	1366 ± 61.2	1394 ± 24.8*	1591± 50.1**	1210 ± 53.9*

* significant at level (P≤0.05)compared with control
** significant at level (P≤0.01)

The overall feed intake among treatments was not affected by different Whey levels. However, addition of whey improved the overall feed conversion ratio of broiler significantly (P≤0.05) . Addition of whey up to five percent level significantly improved the overall feed conversion ratio, however five percent level whey reduce feed conversion significantly (P≤0.05)(Table 4).

Table (4). Effect of whey on overall broiler performance (Mean ±SEM) 0-7 weeks of age

Whey %	BWG (g)	FI(kg)	F/G
0	1366 ± 62.4	3.144	2.30*
2.5	1394 ± 38.6*	2.928	2.10*
5	1591 ± 51.3**	3.07	1.89
10	1210 ±29.2*	2.88	2.38*

* significant at level (P≤0.05)compared with control , ** significant at level (P≤0.01)

Carcass weight at 49 days of age was significantly (P≤0.05) increased by adding of 2.5 and 5 percent of whey. However, at this stage 10 percent level whey had significant decrease carcass weight when compared with control group (Table 5).

Supplementation of whey to drinking water significantly increased of the gastrointestinal tract weight with highest percentage of the gastrointestinal tract

to carcass weight occurred in group received 10 % liquid whey (Table 5). The appearance of ceca in chicken received whey were expanded and foamy when compared with control group.

Table (5). Gastrointestinal tract, carcass weight and the percentage of gastrointestinal tract to carcass weight at 49 days of age(Mean ±SEM)

Whey %	GIT (g)	Carcass weight (g)	GIT/C (%)
0	147.6 ± 18.1	1396 ± 31.7	10.5
2.5	162.8 ± 14.2	1493 ± 25.4*	10.9
5	175.6 ± 8.8*	1582 ± 50.5**	11
10	180 ±7.3 **	1263 ±38.2*	14.2

* significant at level (P≤0.05)compared with control
** significant at level (P≤0.01)

DISCUSSION

For the years whey powder has been known as a source of unidentified growth factor and used in poultry diets (Susmel *et al.,* 1995). Body weight gain at 49 days of age in chickens supplemented whey was higher with 2.5 and 5 percent level whey than that of control group. These results are in agreement with others (Al-Ubaid and Bird,1964; Karmenshahi and Rostam, 2006 ; Shariatmadari and Forbes, 2005) in chickens and (Nurmi and Rantala,1973) in turkeys. Prebiotic stimulate the growth and /or activity of select number of bacteria in the GIT and improve the hosts health. Probiotics have been shown to alter gastrointestinal microflora, (Cummings and Macfarlane,2002 ;Cummings *et al,* 2001) The population of useful bacteria likes *lactobacillus* and *bifidobaceria* increases (Zigger , 2000) due to increasing production of volatile fatty acids. Therefore the environment of GIT becomes unsuitable for the activity and proliferation of pathogens like *salmonella* (Waldroup *et al.,* 1992). Based on concept of competitive exclusion(Nurmi and Rantala ,1973),pathogens will be expelled out of the gut by useful bacteria if it already occupied the gut sites .Researchers attributed the unidentified growth factor of whey to its balance amino acids (Al-Ubaid and Bird ,1964) high protein efficiency ratio (Susmel *et al.,* 1995) rich source of water soluble vitamins (Modler, 1982 ; Zadow and Csiro,1984).Poultry are lacking lactase enzyme (Harms *et al.*,1977) and whey as liquid form had 5 percent lactose (Table-1) (Tariq, 2007). Therefore high levels of whey to poultry drinking water can not digested well and may cause some osmotic diarrhea that we saw in the chickens fed 10 percent whey. The lower weight at 49 days of age may also attribute to this effect. The overall improvement of feed conversion ratio in this study was supported by others (Barnett and Bird,1959;Karmenshahi and Rostam, 2006). There were some reports showing whey powder up to 4 percent increase fat and protein digestibility (Balloun, and Khajaren ,1974; Susmel *et al.,* 1995) and increase absorption of some minerals like calcium and phosphorus (Al-Ubaid and Bird ,1964 ; Shariatmadari and Forbes ,2005) these factors can improve the efficiency of feed consumed by birds. Partial improvement might be related to the beneficial effect of lactose on gut

microorganisms like *lactobacillus* and *bifidobacteria* in chickens (Al-Ubaid and Bird ,1964 ; Barnett and Bird, 1959, Corrier *et al.*,1990).

Lactose that is a major component of whey (Zigger, 2000), is a prebiotic but since poultry are lacking lactase enzyme (Harms *et al.*,1977) then lactose can not be digested or absorbed efficiency and almost research to ceca and large intestine intact (Langhout ,1998; Spring *et al.*, 2000). In ceca the population of useful bacteria like *lactobacillus* and *bifidobacteria* (Spring *et al.*, 2000) increases and the pH of GIT decreases due to increasing production of volatile fatty acids. Therefore environment of GIT becomes unsuitable for activity and proliferation of pathogens like *Salmonella* (Nurmi and Rantala ,1973 ; Waldroup *et al.*, 1992). Lactose as a prebiotic can alleviate the conditions of the gut in favor of colonization of useful bacteria (Langhout , 1998, Spring *et al.*, 2000). Therefore increase the ceca weight and volume also the foamy form of ceca are all the evidence clearly indicating lactose in whey is fermented by *lactobacillus* and / or *coliforms* (Tellez *et al.*,1993). Heavies GIT of the chickens watered high level of whey is also related to the heavier ceca in this study by increase whey level the ceca were bigger and foamier, this result was in agreement with Karmenshahi and Rostam (2006) and also conformed by other (Corrier,1999) since microflora in the ceca of younger chickens (0-21) days are not completed yet. Therefore, the chickens received more whey in comparison with control group, feed conversion ratio (F/G) should be better and feed is less digested under the conditions of this study, use of whey at level of five percent had beneficial effects on broiler performance at rearing period.

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تأثير إضافة الشرش السائل الطازج مع ماء الشرب على الأداء الإنتاجي لفروج اللحم

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المستخلص

أجريت هذه الدراسة في كلية الزراعة – جامعة الكوفة بجمهورية العراق للفترة من 2007/11/24 لغاية 2008/1/8 لمعرفة تأثير إضافة مستويات مختلفة من الشرش في ماء الشرب المقدم للأفراخ على الأداء الإنتاجي لفروج اللحم.

استخدم في الدراسة (240) فرخاً من نوع (لومان) تم جلبها من احد المفاقس الأهلية في الحلة وقسمت الأفراخ على أربع مجاميع حسب معاملات التجربة وبواقع ثلاثة مكررات للمعاملة الواحدة . وقد تم مزج الشرس الطازج وتقديمه يومياً مع ماء الشرب بمستويات 0 و 2.5 و 5 و 10 %. وبصورة حرة خلال فترة التربية والبالغة (49) يوماً.

الزيادة الوزنية عند عمر 49 يوماً في الأفراخ التي أعطيت 2.5 و 5 % شرش تفوقت معنوياً ($P\leq0.05$) و ($P\leq0.01$) على التوالي على باقي المجاميع بينما لوحظ إن إضافة 10 % من الشرش قد أدى إلى تقليل معدل الزيادة الوزنية مقارنة بمجموعة السيطرة معنوياً ($P\leq0.05$) خلال الفترة (33 – 49) يوم من عمر الأفراخ. كما لوحظ إن إضافة الشرش أدت إلى تحسين كفاءة التحويل الغذائي للعلف خلال الفترة (20 – 49) يوم ، كما أدت إلى تحسن معنوي ($P\leq0.05$) في وزن الذبيحة بعمر 49 يوم في مجموعة 2.5 أو 5%.

أما وزن الأمعاء فكان يزداد طردياً مع زيادة نسبة الشرش إذ حققت مجموعة 10 % أعلى وزن. نستدل من ذلك إن إضافة الشرش بالمستويات 2.5 و 5 % إلى ماء الشرب المقدم للأفراخ أدى إلى تحسين في الأداء الإنتاجي لفروج اللحم.