Effects of Supplemental Dietary Emulsifier (LIPOSORB) on Growth Performance and Visceral Organ Weight

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Abstract
Supplemental emulsifiers have reported positive effects in young poultry since their lipase activity and emulsifying capacity are low. Reports on the effects of supplemental emulsifiers on relatively mature broilers are limited. Objective of this study was to determine the effects of two doses of commercial emulsifier (LIPOSRB®) in broiler chicken from day 10-40. Straight-run cobb 500 commercial broiler chicks (n=105) in 15 floor pens received one of the three experimental diets from day 10-40. Experimental diets were, 1) control (a starter diet from day 10-21 and a finisher diet from day 22-40), 2) same control diets+ 0.05% emulsifier and 3) same control diets + 0.1% emulsifier. Compared to control, 0.05% dietary emulsifier significantly ($p<0.05$) increased the live weight on day 14 and 21, and weight gain from day 10-13 and 10-21.Those parameters were unaffected due to emulsifier during day 22-40. Emulsifier did not have significant effects ($p>0.05$) on final growth performance parameters such as live weight on day 40, weight gain from day 10-40, total feed intake and feed conversion ratio (FCR). Visceral organ and fat pad weight, and faecal N content were not significantly ($p>0.05$) altered due to emulsifier. Percentage of the sum of the weights of thigh and drumstick was significantly higher for the birds fed 0.1% emulsifier. Shank colour score of the birds fed 0.05% emulsifier (3) was significantly higher than those fed control (2) and 0.1% emulsifier diets (2). It was concluded that synthetic emulsifier improves the growth performance of young (from day 10-21), but not relatively mature broilers (from day 22-40) and thus the supplementation of broiler diets with commercial emulsifiers is recommended only for starter periods.

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Introduction

Improved broiler breeds need diets with high energetic concentrations to meet their nutritional requirements. Incorporation of fats and oils has been recognized as a practical method for meeting the high energetic requirements of those birds and to provide extra caloric effects (Tang *et al.*, 2007). Apart from serving as an energy source, lipids provide essential fatty acids, aid fat-soluble vitamin absorption, improve palatability and result in relatively lower metabolic heat production during digestion. Young poultry do not utilize and absorb fats, especially animal fats effectively and fat retention improves with age in poultries, regardless of fat source or fat level (Krogdahl 1985; Krogdahl and Sell, 1989). Poor fat digestion in young poultry has been attributed to low lipase activity (Krogdahl and Sell, 1989; Noy and Sklan, 1995) and emulsification capacity (Kroghahl 1985; Green and Kellog, 1987). Emulsification is required for micelle formation and the absorption of fat. Several studies (Krodghal, 1985; Roy *et al.*, 2010) have shown that the supplementation diet with various emulsifiers improves the utilization efficiency of dietary fat by poultry.

Though it has been reported that fat digestion capacity increases with age, Polin and Hussein, (1982) have reported that even in mature poultry fat absorption capacity was lower than 90%. Therefore, it is hypothesized that emulsifiers could make positive effects in relatively mature broilers as well. Objective of this study was to determine the effects of two doses of synthetic emulsifier (LIPOSRB) on growth performance and visceral organ weight of broiler chicken from day 10-40.

Materials and Methods

Day old broiler chicks were obtained from the hatchery of the NELNA farm. Brooding was done for 9 days. During which birds were fed a commercial broiler starter diet. On 10th day, a total of 105 were individually weighed and allocated into 15 floor pens so that live weight variation among the pens was minimum. Subsequently pens were randomly assigned into three treatments; treatment 1. Control diets (Starter diet till day 21 and a commercial finisher diet from 22-40 day) without fat emulsifier (LIPOSORB; PETRUST Pharmaceuticals, Vivek Building, Nr. hadapsar

Industrial Estate Pune Maharashtra India 411013), treatment 2. Same control diets with 0.05% emulsifier and treatment 3. Same control diets with 0.1% emulsifier. Experimental diets were fed from day 10-40, *ad libitum*. According to manufacturer, LIPOSORB contains Phosphatidyle choline, Lysophosphatidyle choline and Polyethylene Glycol Ricinoleate. Ingredient composition of the starter and finisher diets are given in Table 1. Shank colour of two randomly selected birds from each pen was determined using Roche colour chart on day 29. Faecal samples collected on day 39 were used to determine N content by Kjeldhal method.

Two randomly selected birds from each pen were killed on day 40 to determine the carcass parameters. Data were statistically analyzed using GLM procedure of SPSS. Significant means were compared using Turkey Test. Pre determined contrasts were done to compare control vs emulsifier inclusion. Shank colour was statistically analyzed using Kuskal Wallis test.

Results and Discussion

Orthogonal contrast between the control and emulsifier inclusion showed that supplemental emulsifier significantly increased the live weight on day 14, 21 and, weight gains from day 10-13 and 10-21. However, of the two doses of emulsifier, 0.05% was found to be more effective than 0.1%. Live weight of the birds on day 14, 21 and weight gain from day 10-13 and 10-21 of the birds fed control and 0.1% emulsifier were not significantly different. Meanwhile, 0.05% emulsifier significantly improved the same parameters, compared to the control. Interestingly, above growth parameters were unaffected due to LIPOSORB after day 21(Table 2). Zhang *et al.* (2011) have also reported that supplemental emulsifiers improve the performance of young (up to day 21) broilers. Beneficial effects of emulsifier in young chicks up to day 21 contradict the conclusions of Kroddahl (1985) that small intestine is mature

Table1: Ingredient composition of the starter and finisher diets (control diets)

Feed ingredient	Starter Up to day 21(g/kg)	Finisher from day 22-40 (g/kg)
Maize	510	567
Soya bean meal	210	220
Rice polish	140	100
Oil	15	40
Pro meal	40	40
Salt	3	3
Vit/trace mineral mix	2	2
DCP	6	6

Table2. Effects of fat emulsifier on growth performance, carcass parameters, faecal N content and shank colour of broiler chicken

Parameter	Dietary treatment			SEM	P value
	Control	LIPOSORB 0.05%	LIPOSORB 0.1%		
Live weight on day 10	284.8	281.4	280.6	4.5	0.79
day 14	421.0^{b}	448.0^{a}	438.2^{ab}	6.3	0.03
day 21	726^{b}	771.2^{a}	753.6^{ab}	11.6	0.05
day 40	2142.8	2163.6	2149.2	36.9	0.9
Total feed intake (g/bird)	3314	3340	3359	16	0.19
Weight gain day 10-13	136^{b}	166.6^{a}	157.6^{ab}	7.80	0.04
day 10-21	441.8^{b}	489.8^{a}	473.2^{ab}	13.796	0.08
day 10-40	185.0	1882.0	1868.6	37.19	0.9
FCR day 10-40	1.78	1.77	1.80	0.03	0.85
Carcass and Visceral organ weights					
empty carcass	1.51	1.53	1.53	0.05	0.98
dressing % without giblets	68.85	73.29	70.81	1.58	0.17
liver %	3.14	3.01	3.35	0.09	0.06
breast %	71.01	69.33	68.36	2.08	0.67
thigh + drumstick %	24.98^{b}	25.2^{b}	27.40^{a}	0.36	0.00
gizzard %	2.65	2.39	2.60	0.09	0.14
fat %	1.41	1.44	1.30	0.18	0.85
fecal N	2.82	2.95	2.65	0.1	0.13
Shank colour (median score)	2	3	2		0.45

Values within a row bearing same superscripts are not statistically different (p>0.05)

and fully functional by day 10-14. Zhang *et al.* (2011) found that supplemental emulsifiers were more effective when diets contained lower level of metabolizable energy and have higher levels of fat, particularly animal fat. Importantly, results of the present experiment suggest that emulsifiers are effective in young broiler even with diets containing lower level of vegetable oil. However, birds fed diets supplemented with LIPOSORB could not maintain their early stage advantage in growth performance and thus reported similar live weight on day 40, weight gain from day 10-40 and FCR to control. Zhang *et al.* (2011) also reported similar findings.

Empty carcass weight, percentage weight of the liver, gizzard, breast meat and abdominal at pad, dressing percentage were not significantly altered due to supplemental emulsifier LIPOSORB. However, percentage of the sum of the weights of thigh and drumstick was significantly higher for the birds fed 0.1% emulsifier. Faecal N content was also not affected by the emulsifier. Zhang *et al.* (2011) Poulin and Hussain (1982) have also not recorded an improvement in digestibility of crude protein due to fat emulsifier supplementation. Though not statistically significant, the shank colour of the birds fed 0.05% emulsifier (3) was higher on day 29 compared to that of those fed control and 0.1% emulsifier diet (2). Faulks and Southon (2005) have demonstrated positive relationship between improved fat digestion and beta carotene availability. Therefore, better shank colour may be an indirect effect of improved fat digestion due to emulsifier.

Conclusion

It was concluded that synthetic emulsifier improves the growth performance of young (from day 10-21), but not relatively mature broilers (from day 22-40). Therefore, no beneficial effects can be obtained by supplementing broiler finisher diets with commercial emulsifiers.

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