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In ovo and early post hatch feeding and its effect on hatchability and broiler chick's quality

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Abstract
A biological experiment was carried out to investigate the effect of *in ovo* and early post-hatch feeding of early chick nutritional supplement (ECNS) on the hatchability and chick quality of broiler chicken. Five hundred and forty embrocated eggs were injected with 0.5 ml of normal saline, 10 per cent glucose, lysine, 0.5 per cent threonine, and 0.5 per cent β-hydroxy-β-methylbutarate (HMB) into amniotic fluid of 18 days old embryos. The hatched-out 288 broiler chicks were randomly allocated to six treatments of 48 chicks each. The steamed corn-soyabean and fish meal based early chick nutritional supplement (ECNS) was provided to broiler chicks immediately after hatch and continued till they were packed in the transport box. The data on hatchability, hatchling weight, egg/chick weight ratio, and transit weight loss of broiler chicks were recorded. *In ovo* feeding significantly ($p<0.01$) increased hatchability and hatchling weight ($p<0.05$). *In ovo* feeding combined with ECNS significantly ($p<0.05$) reduced transit weight loss in broiler chicks. Whereas early chick mortality was not significantly affected. Both *in ovo* and early post-hatch feeding has a solid beneficial effect in commercial broilers as it reduces transit weight loss and improves the chick quality of broilers without affecting the hatchability, it can be adopted under field conditions.

Keywords: *In ovo* feeding, early post-hatch feeding, hatchling weight, transit weight loss, broiler chick quality

1. Introduction
The first seven days of fast-growing commercial broilers accounts for 17 per cent of its growing period. These broilers are forced to fasting of in their 5-7 per cent of life due to a wide "hatching window". Moreover, broiler chicks were further subjected to fasting of 24 - 36 hours till it reaches the farm due to vaccination, packing, and transport. Bhanja *et al.*, 2009) [1] reported that the broiler chicks lose their body weight by 4 g per day due to dehydration and utilization of yolk and pectoral is muscle glycogen utilization during transportation time. The chicks are also more susceptible to disease causing organisms (Dibner *et al.*, 1996) [2], and hampers the growth of vital tissues (Halevy *et al.*, 2000) [3]. Noy *et al.*, 2001 [4] reported that a good start leads to a good 7th day weight of uniform flock size which is directly correlated with marketing weight of the broilers.

Early feeding in commercial broilers has beneficial effects such as eliminating ketosis, reducing transit weight loss, minimizing slow starters, improving appetite, increasing growth performance, enhancing immunity, improving survivability, minimizing carcass rejections, increasing carcass weight and meat yield in broilers (Panda *et al.*, 2013) [5]. Rapid growth potential within a short growing period of time in commercial broilers has provoked scientist's interest in early chick nutrition. At present minimal study has been carried out under field conditions. Therefore, this nutritional study was conducted to investigate the effect of *in ovo* and early post-hatch feeding on the hatchling weight, egg/chick weight, and transit weight loss of broiler chicks.

2. Materials and Methods
Five hundred and forty hatching eggs with uniform size (68 ± 1g) were divided into nine treatments and sub divided in to three replicates of each 30 eggs.

The embryonated eggs were injected with various nutrient solutions as per the method described by Noor *et al.* (1995) [6] method. Each of 90 embryonated eggs were injected with different treatment solutions *viz*., 10 per cent glucose, lysine, 0.5 per cent threonine, and 0.5 per cent β-hydroxy-β-methylbutarate (HMB) into amniotic fluid of 18 days old embryos. One group is kept as injected control who is injected with 0.5 ml of Normal Saline to assess the stress of injection and handling, The control eggs were subjected to similar conditions i.e., kept for 15 minutes in the same environment to normalize the conditions for all the treatment groups. After hatching, 288 broiler chicks were divided in to six treatments of 48 chicks each and further subdivided in to three replicates of 16 chicks. The steamed corn-soya bean and fish meal based early chick nutritional supplement (ECNS) was fed to broiler chicks immediately after hatch and continued till they were packed in the transport box. The control (T_1) birds were fasted for 24 h similar to that occur under field conditions.

Table 1: Experimental design

Treatments	***In ovo* feeding**			**Early post hatch feeding**		
	Eighteen days old embryonated eggs utilized for injection (Nos)		**CSF WS ECNS* feeding after hatch (No. of birds utilized)**			
	R1	R2	R3	R1	R2	R3
Control	30	30	30	16	16	16
Normal saline 0.5 ml	30	30	30	16	16	16
10 % glucose 0.5 ml	30	30	30	16	16	16
0.5 % lysine 0.5 ml	30	30	30	16	16	16
0.5 % Threonine 0.5 ml	30	30	30	16	16	16
0.5 % β-hydroxy-β methylbutarate (HMB) 0.5 ml	30	30	30	16	16	16

* CSF WS ECNS - Steamed corn-soya bean and fish meal Early Chick Nutritional Supplement

The experimental birds were fed *ad libitum* with pre-starter diet from 1-7 days, starter mash from 8-21 days and finisher mash from 22 days till marketing. The experimental diets were prepared as per as per BIS (2007) [7] recommendations.

Data on the weight of the hatching egg, hatchling, and chick were recorded with 0.2 g accuracy by using electronic balance. The hatchability, and egg/chick weight ratio were calculated. The body weight of the broiler chicks was recorded at the hatch, and at the farm after transportation to calculate transit weight loss. Data collected in this experiment were statistically by Statistical Package for Social Science (SPSS, 1999) [8] software and the means were compared by Duncan multiple range test at a five per cent significance ($p<0.05$) level.

The Institutional Animal Ethics Committee of the Tamil Nadu Veterinary and Animal Sciences University, Chennai -600 051 assessed and approved all institutional guidelines and experimental procedures used in this experiment.

3. Results and Discussion

The data on weight of hatching egg, hatchability, day-old chick weight, ratio of egg/chick weight and transit weight loss in broiler chicks experimented with *in ovo* and early post-hatch feeding is presented in Table 2.

The hatching egg weight was between 68.77 and 65.89g on the day of set in the incubator. On the day of *in ovo* feeding, which ranged from 60.47 to 64.59 g i.e., on the 18th day of incubation. The hatchability was improved significantly ($P<0.01$) by *in ovo* feeding (99.67 percent) compared to control (92.22 per cent) and was witnessed by Kulandaivel (2007) [9] who reported that the *in ovo* feeding increased the per cent hatchability by 7 per cent over that of control. The hatch weight of broilers was significantly ($p<0.05$) increased (48.69 to 49.01 g) by *in ovo* delivery of glucose, lysine, HMB nutrients than that of normal saline, threonine and control (47.73 g). This finding is in line with the results of Kulandaivel (2007) [9] who recorded higher hatch weight in treatment groups (37.76 to 37.85 g) than of control (37.66 g). The egg/chick weight ratio of broilers recorded in this study was significantly affected in this study (1.40 to 1.43) than 1.44 of control was in agreement with the findings of Kulandaivel (2007) [9] who also found significant variations in the ratio ranged from 1.32 to 1.39 in treatment groups and 1.39 in control.

The transit weight loss of the broiler chick was significantly ($p<0.05$) reduced in both *in ovo* and ECNS-fed groups (6.46 to 4.66 per cent) compared to the control (6.60 per cent). On perusal of literature, no scientific report could be found to justify this research findings. The mortality of the chick during first week was not statistically influenced by *in ovo* feeding of glucose, lysine, and threonine and early post-hatch feeding of ECNS.

The beneficial effect of reducing the transit weight loss, stress, and early mortality in chicks might be due to the prevention of dehydration of chicks during holding and transit time to the farm. The improved performance might be due to early development of gastrointestinal tract of the broilers by the nutrients supplied by the by the *in ovo* and post-hatch feeding of CSF WS ECNS. In addition the secretion of brush border enzymes by the stimulus of the presence of nutrients and feed particles could played a vital role in the digestion and absorption of nutrients.

Table 2: Effect of in ovo and early post-hatch feeding on mean (±SE) hatching egg weight, hatch weight and egg/chick weight ratio and transit chick weight loss

Treatments	**Hatching egg weight (g)**		**Hatch weight (g)**	**Egg / Chick weight ratio**	**Hatchability (%)**	**Transit Weight Loss (%)**	**Early chick mortality (%)**
	On Setting	**On 18th d of Incubation**					
	(N=90)	**(N=90)**	**(N=48)**	**(N=48)**	**(N=3)**	**(N=48)**	
Control	68.81±0.05	60.51±0.05	47.73^{b}±0.29	1.44^{a}±0.01	92.22^{b}±0.02	6.60^{a}±0.25	1.54±0.90
0.5% Normal saline & CSF WS	68.77±0.05	60.47±0.05	48.39^{ab}±0.30	1.42^{ab}±0.01	96.67^{a}±0.00	6.02^{a}±0.24	0.00±0.00
10% Glucose & CSF WS	68.86±0.05	60.56±0.05	48.69^{a}±0.17	1.42^{bc}±0.00	96.67^{a}±0.00	6.46^{a}±0.25	0.00±0.00
0.5% Lysine & CSF WS	68.85±0.05	60.55±0.05	48.93^{a}±0.32	1.41^{bc}±0.01	96.67^{a}±0.00	6.05^{a}±0.22	0.00±0.00
0.5% Threonine & CSF WS	68.89±0.05	60.59±0.05	48.34^{ab}±0.31	1.43^{ab}±0.01	96.67^{a}±0.00	5.75^{a}±0.30	0.00±0.00
0.5% HMB & CSF WS	68.78±0.07	60.48±0.07	49.01^{a}±0.22	1.40^{c}±0.01	96.67^{a}±0.00	4.66^{c}±0.23	1.19±0.19
Statistical significance	NS	NS	*	*	**	*	NS

CSF WS - Steamed corn-soya bean and fish meal

N- Number of observations, NS - Not Significant * Significant at $P<0.05$ level, ** Highly significant at $p<0.01$ level

Mean values with any one common superscript in a column do not differ significantly

4. Conclusion

In ovo feeding increased hatchability in this study, Combined feeding of both *in ovo* and CSF WS ECNS significantly increased hatch weight, egg/chick weight ratio, and significantly reduced transit weight loss in chicks whereas chick mortality during first week was not significantly affected by early feeding. With regard to the overall long term beneficial effect of ovo and early post hatching feeding on broiler performance, since it decreases transit bodyweight loss; mitigates slow starts by eliminating ketosis without affecting chick viability, this product is able to be used under field conditions for improving chicks' quality and subsequent production. This helps in obtaining higher returns and better growing charges for the farmers involved in the contract farming system.

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