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IN–OVO FEEDING AND EARLY NUTRITION BY GLUCOSE AND THEIR EFFECTS IN IMPROVING HATCHABILITY AND PERFORMANCE OF FAYOUMI CHICKS

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ABSTRACT: Two experiments were done to investigate in-ovo feeding of glucose (Exp. 1) for enhancing hatchability and hatching weight by using 300 fertile eggs of Fayoumi breeder. Eggs divided into 5 groups in 60 eggs/ treatment (20/ replicate). At 18th day of incubation, eggs injected in the air sac as following groups: first (control) without injection, second was punched (dry punch), third was injected by 0.1 ml distillated water (sham group), fourth and fifth were injected by 0.1 ml glucose at concentrationsof 2.5% and 5%, respectively. Results indicate that hatchability and hatching weight of fourth group recorded significant improvement by 14.71% and 5.68%, respectively compared with control.

In the second experiment, a total number of 120-unsexed Fayoumi chicks, a day old, were arranged to 4treatments in 3 replicates (10 chicks each) as follows: the first group (control) was fed basal diet. The rest 3 groups were chosen from the former experiment, control without injection, groups injected with 0.1 ml glucose either at 2.5% and 5% concentration. All these 3 groups fed the basal diet incorporated with 5% glucose syrup from 1-28 days of age then switched to the control diet up to 56 days of age. Results show that the improvement in hatching weight was continued during starting and growing periods, also feed conversion ratio was enhanced by 10.23% for the group injected with 0.1 ml glucose 2.5% and fed diet contained glucose syrup compared to control. Carcass characteristics were not affected by any of the studied treatment except carcass % which significantly increased in chicks fed glucose syrup and injected with 0.1 ml glucose 2.5%.

Conclusion: in-ovo feeding with glucose 2.5% improve hatchability and hatching weight of Fayoumi chicks. Moreover, incorporating hatched chicks with glucose syrup enhance performance without negative effect on blood glucose and lipid profile.

Key words: in-ovo feeding - glucose - Fayoumi chicks - performance - hatchability.

INTRODUCTION

Hatchability is a process which refers to the production of new generation (Koenig, 1982). To meet the high demand on poultry products, producers are adopting new technologies that will enable them to increase production with reducing cost. Most of these production technologies focus on enhancing the hatchability of local strains. In-ovo feeding with carbohydrates may improve hatchability percentage (Uni et al., 2005). Carbohydrates supplementation during the late term embryonic phase may be increased glycogen from 6 to 12 mg per gram of liver tissue to supply the extra energy required for hatchability process (Foye et al., 2006). Hence, the shortage of energy drives from critical body resources (primarily muscle) to provide the energy needed for maintenance, caused a decrease in body weight, reduction in pectoral muscles and decline of organ weight (Sklan, 2001). Zhai et al. (2011) studied in-ovo injections with different volumes of a carbohydrates solution at 18.5 days of incubation, and verified that chicks body weight and the ratio of body weight to egg weight on the day of hatch were positively related to volume used ($P \leq 0.05$). Feeding technique enables the early adaptation of the avian gastrointestinal tract during embryonic development. Where, the final days of incubation and the first few days after hatching are a critical period for survival and development of late-term embryos and neonates in poultry because of considerable energy catabolism. Post hatch, chicks move from nutrition based on fatty acids from the yolk sac to a diet based on grains like corn and proteins from soybean meal (Croom et al., 1999). Furthermore,the digestion and absorption of carbohydrates by chicks is very low which vary from 43% to 53% according to Noy and Sklan (2001). In this respect, Sklan (2003) attributed low intestinal absorption of carbohydrates on day of hatch to the presence fatty acids from yolk sac, where, its nutrients are hydrophobic hence these substances inhibit the absorption of hydrophilic compounds. Many authors (Noy and Sklan, 1995 and Uni et al., 1995) reported that chicks are fully competent in starch digestion shortly after hatch. Moreover, the uptake capacity of the duodenum for glucose increases during the same period (Noy and Sklan, 1996). From this point, there is a need for more carbohydrate alternative sources with more availability than starch and non-starch polysaccharides in starter diet such as glucose (Longo et al., 2007). Sugars have been accepted as better energy donor than starch in the poultry system especially at first period of age due to its higher metabolizability. In this respect, Abebe and Animut (2017) concluded that sugar syrup could substitute maize up to 28% in formulating broilers' ration without adverse effect on growth performance. In another study, molasses and cane condensed molasses soluble were used in feeding broilers (Waliszewski et al., 1997).

Owing to the importance of in-ovo feeding and its role in improving the hatching weight, a study was undertaken to examine the effect of in-ovo injection with glucose on the hatchability traits in Fayoumi eggs and the effect of continuous feeding with glucose syrup on offspring growth performance during the first four weeks of age.

MATERIALS AND METHODS

The experimental work was carried out at El-Fayoum Poultry Farm, Animal Production Research Institute,

Agriculture Research Center, Ministry of Agriculture, Egypt.

Experiment 1

A total number of 500 hatching eggs with average weight of 45g were obtained from a Fayoumi breeder flock at 35 weeks old. All eggs were incubated at 37.5° C and 65% relative humidity in an automatic incubator. At day 18 of incubation, the eggs were candled then 300 fertile eggs were randomly divided into five groups each of 60 eggs (20 eggs/replicate). Eggs were punctured in the large end to make a gap by hard and thin stylus, where ethyl alcohol were used to sterile this area. Treated eggs were injected in air sac by using graded insulin syringe (1 ml), after that sealed by wax. The experimental treatments were as follows:

1- The 1st group was un-injected group (control).
2- The 2nd group was injected control (dry punch control).
3- The 3rd group was sham control (injected with 0.1 ml distillated water).
4- The 4th group was injected with 0.1 ml glucose (2.5% concentration).
5- The 5th group was injected with 0.1 ml glucose (5% concentration).

At day 21 of incubation, hatched chicks weight (g) were recorded while un-hatched eggs were inspected and classified as pips. Data of measured parameters were presented as percentage of fertile eggs set. Hatchability % = (No. of hatched chicks/ No. of fertile eggs) × 100

Experiment 2

A total number of 120 unsexed Fayoumi chicks were distributed into 4 groups in 30 chicks/ treatment each with 3 replicates. Chicks of the first group fed the basal diet during starter- grower period (1-56 days) without glucose syrup and served as control group , while, the rest 3 groups were chosen from Exp.1 which were the control group without injection, the group injected with 0.1 ml glucose (G) 2.5% and group injected with 0.1 ml glucose (G) 5%, these three groups were fed starter diet (1-28 days) contained 18% crude protein and 2750 kcal ME/kg diet, and incorporated with 5% glucose syrup as a diet ingredient, a simple source of energy which contains 3500 kcal ME/kg (Abd El-Hakim et al., 2010), then followed by grower diet (29-56 days), contained the same amount of CP and ME, without glucose syrup. Both diets were in mash form. The composition and calculated analysis of the experimental diets are listed in Table (1). All diets were formulated to save the nutritional requirements of Fayoumi chicks according to Agriculture Ministry Decree (1996). Water and feed were offered ad-libitum allover the experimental period. All chicks were kept in cleaned and fumigated cages of wire floored batteries in an open system house under similar conditions of management. At the end of each growth periods, live weight (g) and feed intake (g) were recorded while weight gain (g) and feed conversion ratio (g feed/ g gain) were calculated.

Slaughter traits: At the end of the experimental period (56 days of age), 3 birds from each treatment, within average live weight, were chosen to evaluate carcass characteristics. The carcass, giblets (gizzard, liver and heart) and lymphoid organs (Bursa, thymus and spleen) were separately weighed and listed as percentages of live body weight.

Blood constituents: Individual blood samples were collected in non heparinized tube from 3 birds/group and serum was collected to determine

glucose, total cholesterol (TC), triglycerides (TG), high density lipoprotein (HDL-c), and low density lipoprotein (LDL-c) using commercial kits produced by Biodiagnostic Company, Egypt.

Statistical analysis: Data collected were statistically analyzed by the analysis of variance with general linear model (GLM) procedure (one way analysis) of SAS Institute (SAS, 2004). Significant differences among treatments were performed using Duncan's multiple range test (Duncan, 1955). The experimental model used was: $Y_{ij} = \mu + T_i + e_{ij}$. Where: Y_{ij} = an observation μ = the overall mean, T_i = Effect of treatments, (i; 1, 2,… 5) for Exp.1 and (i; 1, 2, 3 and 4) for Exp.2

e_{ij}= random error.

RESULTS AND DISCUSSION

Experiment 1:

Effect of glucose (G) injection on hatchability %, piped egg % and hatching weight is presented in Table (2). It is noticeable that eggs injected with 0.1 ml G at concentration of 2.5% recorded significantly higher hatchability by 14.71% compared to non-injected control group. This improvement may be due to increase the level of available liver glycogen in embryos, which may be used to facilitate the hatching process (Uni et al., 2005; Bottje et al., 2010). Moreover, group injected with 0.1 ml G 5% recorded significantly higher hatchability percentage compared with control group but lower than others injected with 0.1ml G 2.5% and this result could be explained by Salmanzadeh (2012) who mentioned that increasing the concentration of glucose may cause an allergic reaction under the air sac that stopped the respiration of the developing embryo, causing its death. Current results agreed with early study of Ingram et al. (1997) who reported that in-ovo injection of glucose at levels lower than 25 mg increased the hatchability of fertile eggs. Also, Rizk and Ibrahim (2014) found that hatchability % was significantly increased by injecting fertile eggs of Sinai strain at the 18th day of incubation, in amniotic sac, by 0.3 ml G 1% compared with control or other injected with different nutrients (methionine, bee bread and ascorbic acid) groups. While, these results disagree with the findings of Ipek et al. (2004) who reported that hatchability % of broiler breeder eggs did not differ significantly between all groups (injected with 0.5 ml deionized sterile water containing 5, 10 and 15 mg of glucose). Another study also showed that the injection of glucose in the albumen reduced the hatching percentage of newly-hatched chicks compared with the control group (Bhanja et al., 2008). Also, Pedroso et al.(2006) observed that, when chick embryos received an in-ovo injection of glucose at 16 days of incubation, hatchability decreased. The variation in hatchability percentage results among researches may be due to different concentrations of glucose, time and place of injection and strain used.

Results in Table (2) show that set of eggs injected with 0.1 ml G 2.5% recorded significantly an improvement in piped eggs % followed by those injected with 0.1 ml G 5% compared with control group, dry punch or sham group. The same trend of improvement was observed in hatching weight where the enhancement of weight in the fourth and fifth groups were 5.68% and 4.61%, respectively compared to control group without injection. As reported in a previous study, in-ovo injection of 0.5 ml carbohydrate/egg (maltose, sucrose,

and dextrin mixture in a proportion of 1:1:8) enhanced the hatching weight and energy reserves of hatched chickens (Shafey et al., 2012). Similarly, Tangara et al. (2010) observed that injection of 1.2 ml of 2.5% sucrose + 2.5% maltose/egg into duck eggs increased the hatching weight and liver glycogen concentration on the day of hatch. By using Egyptian local strain Rizk and Ibrahim (2014) concluded that in-ovo injection of glucose significantly increased hatching weight of Sinai chicks compared to control group. In earlier study, Ferket and Uni (2002) concluded that in-ovo feeding of carbohydrates into amnion sac increased hatching weight of turkeys. These outcomes implied that there is a great potential to improve hatching weight by administrating exogenous energy substrates into the air sac of the late-term avian embryos. Also, Bhanja and Mandal (2005) who found that in-ovo glucose injection group of chicks had higher chick weight than sham and un-injected ones. Amitav et al. (2007) showed that chick weight was significantly higher when glucose was deposited either in the yolk sac or amniotic sac than un-injected control group. Where, glucose is a good and easy source of carbohydrates that could be useful for the fetal. Also, administrating it into egg saved the energy from muscle protein followed by increasing of newly-hatched chicks. Same conclusion was recorded by Uni et al. (2005).

IN CONCLUSION

Injecting the hatching eggs at 18th day of incubation in the air sac with 0.1 ml glucose at 2.5% concentration could be a good tool for improving hatchability percentage and hatching weight of Fayoumi strain.

Experiment 2:

Growth performance:

Effect of egg injection and early nutrition with glucose on growth performance during starter and grower periods is illustrated in Table (3). The group of chicks injected with 0.1 ml G 2.5% and fed diet incorporated with glucose syrup (T3) recorded significantly higher starter weight by 10.53% compared with control group. But this group recorded insignificant differences with other groups.

The enhancement in body weight for birds of T3 continued till the end of growing period (56 days) by 12.46% compared to control group. Also, groups of T2 (fed diet incorporated with 5% glucose syrup during first 4 weeks) and T4 (0.1 ml G 5% and fed glucose syrup) recorded significantly higher final weight compared to control. The same trend of live weight was observed in body weight gain. Where chicks of T3(0.1 ml G 2.5% and fed glucose syrup) recorded significantly higher body weight gain compared with control throughout starting, growing and whole periods. In Previous studies Vieira and Moran (1999) and Havenstein et al. (2003) demonstrated that the weight of newly-hatched chicks is an important predictor of market weight in broilers. In earlier research, Salmanzadeh (2012) reported that market age of chicks increased by 60-63 g when hatching weight increased by 1 g. In this study, we found that 1.6 g increase in body weight at hatch due to in-ovo injection of glucose 2.5% resulted in 67.3 g increase in body weight at 56 days of age. This enhancement in final weight is supported by incorporation chicks ration with glucose syrup. Which is an instant energy feed as it contains no ingestible material, has a pleasing aroma

and is more palatable. Also, it could help in eliminating the dust hazard of ingredients and enhance the general appearance of poultry feed (Hussein et al., 2016). Results herein are in agreement with the findings of Salmanzadeh (2012) who reported that chicks received 0.5 ml glucose 15% with injection recorded higher ($P \leq 0.05$) weight gain at 42 days of age compared with a group injected with deionized water and control group (not injected). Moreover, Hussein et al. (2016) concluded that body weight gains of broiler chicks were significantly enhanced by replacing part of yellow corn with 5% sugar syrup compared with control or birds fed diet containing 10% sugar syrup during starter and finisher periods.This additional energy source probably supported the late development of the embryo, resulting in a significant increase in the weight of newly-hatched chickens and their subsequent performance. On the other hand, Leitao et al. (2008) concluded that, the in-ovo injection of glucose had no effect on the chicken performance.

Results documented in Table (4) show that feed intake during starting and overall periods did not affect ($P>0.05$) by any of studied treatments. While during growing period, chicks of T2 (fed diet incorporated with 5% glucose syrup during first 4 weeks), T3 (0.1 ml G 2.5% and incorporated with glucose syrup) and T4 (0.1 ml G 5% and incorporated with glucose syrup) recorded significantly higher feed intake compared with control group. Recently, Hussein et al. (2018) reported that adding graded level of sugar syrup (5% and 10%) to layer hen diet did not show any significant differences in feed intake. Regarding to feed conversion ratio, all groups did not record any enhancement in feed conversion ratio (FCR) during starting and growing periods. On the other hand, the group of chicks of T3 (0.1 ml G 2.5% and fed dietary glucose syrup) significantly achieved an improvement in FCR by 10.23% compared with control group. Also, the two other groups fed dietary glucose syrup (T2 and group of T4) recorded significantly an enhancement in FCR compared to chicks fed un-incorporated one. In this respect, Abd El-Hakim et al. (2010) reported that inclusion of glucose in low metabolizable energy diet during starting period (10 days after hatch) recorded numerically an improvement in broiler FCR during finishing and overall periods compared with control group. Also, Bhanja et al. (2008) showed that the feed conversion ratio during early post-hatch period was better in the glucose-injected group than the control group. In addition to Salmanzadeh (2012) who concluded that in-ovo feeding with 0.5 ml glucose 15% significantly improved FCR in broilers compared to control.

Carcass characteristics:

Effect of egg injection and early nutrition with glucose on carcass characteristics is presented in Table (5). It is worthy to note that chicks fed glucose syrup and previously injected with 0.1 ml G 2.5% recorded significantly higher carcass percentage being 4% compared to control group.While, the worst value was recorded for control positive group (fed diet incorporated with 5% glucose syrup during first 4 weeks) with a decline percentage of 4.09% compared to control. On the other hand, heart, liver, gizzard and giblets percentages did not record any significant differences among various groups. Along the same line, Rizk and Ibrahim (2014) reported that in-ovo

injection with glucose increased significantly breast and thigh weights of Saini strain compared with control group and other treatments. Hashim et al. (2013) also concluded that adding 15% sugar syrup in broiler diets resulted in the production of high-quality thigh and breast meats.

Lymphoid organs:

Results of lymphoid organs for Fayoumi chicks are illustrated in Table (6). Chicks fed different treatments did not record significant improvements in thymus %. On the other hand, chicks fed diet incorporated with 5% glucose syrup during first 4 weeks (T2) recorded significantly higher bursa % compared to other groups. Also, spleen % was significantly increased in chicks of T2 (fed diet incorporated with 5% glucose syrup during first 4 weeks) and T3 (0.1 ml G 2.5% and fed glucose syrup) compared with T1(control). Similar findings were reported by Amer et al. (2004) and El-Abasy et al. (2004) who reported higher relative lymphoid weight of the spleen and bursa in chickens when administered with sugar cane extract. Rizk and Ibrahim (2014) also concluded that spleen % was significantly increased in glucose in-ovo injection group. On the other hand, Awais and Akhtar (2012) concluded that no-significant effect of oral cavage of sugar cane extract (4 ml/kg for 3 days) on the development of lymphoid organs in chickens as compared to control group.

Blood constitutes:

Impact of different treatments on some blood serum constitutes is listed in Table (7). There were no significant differences among all groups in serum glucose, triglycerides, total cholesterol and HDL-c. The results are in line with Hussein et al. (2016) who concluded that supplementation of sugar syrup at different levels (5%, 10% and 15%) to broiler diets had no significant effect on blood glucose. While, adding the lowest level (5%) significantly decreased blood cholesterol and triglycerides in chickens compared with those fed control diet. Whereas, the results disagreed with the finding of Bhanja et al. (2008) who reported that serum glucose of broilers was significantly higher in group injected with glucose at the first day of incubation compared with control.

Regarding to LDL-cholesterol, group of T3 recorded significantly lower value than control by 19.14%. Reduced serum LDL-c concentrations in birds fed diets incorporated with glucose syrup are possibly related to that syrup contributes energy without the addition of lipids, then the formation of harmful cholesterol could be minimized (Abebe and Animut, 2017). Our results are in agreement with the research of Rizk and Ibrahim (2014) who documented that the high value of HDL-c was recorded for glucose injection group. While, the same group did not show significant difference in LDL-c value compared with control.

CONCLUSION

We could conclude the results of this research as follows:

1. In-ovo feeding of 0.1 ml glucose at concentration of 2.5% increased hatchability percentage and hatching weight of Fayoumi chicks.
2. In-ovo feeding and continuous incorporating of glucose syrup in the diet improved growth performance of Fayoumi chicks.
3. Feeding glucose syrup during starter period did not influence blood sugar level.

These findings provide a basis for future work on the use of simple source of carbohydrate (glucose) in early phase of poultry nutrition.

Table (1): Composition and calculated analysis of control and tested diets (Exp.2).

Ingredients %	**Control diet (1-56 days)**	**Tested diet (1-28 days)**
Yellow corn	60.80	54.47
Soybean meal (44%)	28.00	29.00
Glucose syrup	0.0	5.00
Wheat bran	7.40	7.70
Limestone	1.45	1.45
Di-calcium phosphate	1.38	1.42
L-lysine	0.02	0.02
Dl-methionine	0.10	0.09
Menirals and vitamin mix.*	0.30	0.30
Salt	0.35	0.35
Sodium bicarbonate	0.10	0.10
Choline chloride	0.10	0.10
Total	100	100
Calculated analysis:**		
Crude protein (%)	18.2	18.3
ME (kcal/kg)	2761	2750
Lysine	1.03	1.05
Methionine	0.42	0.40
Meth.+cys.	0.73	0.71
Calcium	0.95	0.95
Available Phosphorus	0.42	0.42

*Each 3 kg contains: Vit A 12 000 000 IU, Vit D3 2 000 000 IU, Vit E 10g, Vit K3 2g, Vit B1 1g,Vit B2 5g, Vit B6 1.5g, Vit B12 10mg , Nicotinic acid 30g, Pantothenic acid 10g, Folic acid 1g, Biotin 50mg, Iron 30g, Copper 10g, Zinc 50g, Manganese 60g, Iodine 1g, Selenium 0.1g, Cobalt 0.1g and carrier ($CaCO_3$) up to 3 kg.,

**According to the Egyptian Regional Center for Food and Feed (RCFF, 2001).

Table (2): Effect of hatchability, pip percentages and hatching weight (Exp.1)

Treatments	**Hatchability %**	**Pip %**	**Hatching weight (g)**
T1 (Control)	82.73 ^{c}	3.03 ^{b}	27.96 ^{b}
T2(Dry punch)	82.35 ^{c}	3.33 ^{a}	28.34 ^{b}
T3 (0.1 ml distillated water)	90.00 ^{b}	3.33 ^{a}	28.49 ^{b}
T4 (0.1 ml G 2.5%)	97.44 ^{a}	2.56 ^{d}	29.55 ^{a}
T5 (0.1 ml G 5%)	88.73 ^{b}	2.77 ^{c}	29.25 ^{a}
Standard error	± 0.476	± 0.001	± 0.211
P value	0.0001	0.0001	0.0018

a, b, c and d Means in each column, with same superscripts are not significantly different., G: glucose, average egg weight = 45 g.

Table (3): Effect of egg injection and early nutrition with glucose on live body weight and body weight gain of Fayoumi chicks (Exp.2)

Treatments	**Initial weight**	**Live body weight (g)**		**Body weight gain (g)**		
		Starter 28 days	**Grower 56 days**	**Starter 1-28days**	**Grower 29-56 days**	**Overall 1-56 days**
T1	28.0^{b}	214.7^{b}	540.0^{c}	186.7^{b}	325.3^{b}	512.0^{c}
T2	28.0^{b}	228.3^{ab}	580.0^{b}	200.3^{ab}	351.7^{ab}	552.0^{b}
T3	29.6^{a}	237.3^{a}	607.3^{a}	207.7^{a}	370.0^{a}	577.7^{a}
T4	29.3^{a}	226.7^{ab}	570.0^{b}	197.4^{ab}	343.3^{ab}	540.7^{b}
Standard error	±0.325	±4.17	±7.56	±4.15	±8.33	±7.66
P value	0.016	0.031	0.002	0.040	0.031	0.002

a, b and c Means in each column, with same superscripts are not significantly different., G: glucose

T1: control fed basal diet without glucose syrup. T2: control fed diet incorporated with 5% glucose syrup during first 4 weeks, T3: inject egg with 0.1ml G 2.5%+5% glucose syrup during first 4 weeks, T4: inject egg with 0.1ml G 5%+5%glucose syrup during first 4 weeks

Table (4): Effect of egg injection and early nutrition with glucose on feed intake and feed conversion ratio of Fayoumi chicks (Exp.2)

Treatments	Feed intake (g)			Feed conversion ratio (g feed/g gain)		
	Starter 1-28 d	Grower 29-56 d	Overall 1-56 d	Starter 1-28 d	Grower 29-56 d	Overall 1-56 d
T1	590	1160[b]	1750	3.16	3.57	3.42[a]
T2	600	1197[a]	1797	3.00	3.40	3.26[b]
T3	585	1186[a]	1771	2.82	3.21	3.07[c]
T4	584	1182[a]	1766	2.96	3.44	3.27[b]
Standard error	±20.87	±8.98	±26.10	±0.12	±0.10	±0.03
P value	0.942	0.014	0.656	0.317	0.157	0.0002

a, b and c Means in each column, with same superscripts are not significantly different., G: glucose

T1: control fed basal diet without glucose syrup. T2: control fed diet incorporated with 5% glucose syrup during first 4weeks, T3: inject egg with 0.1ml G 2.5%+5% glucose syrup during first 4 weeks, T4: inject egg with 0.1ml G 5%+5%glucose syrup during first 4 weeks

Table (5): Effect of egg injection and early nutrition with glucose on carcass characteristics of Fayoumi chicks (Exp.2)

Treatments	Carcass %	Heart %	Liver %	Gizzard %	Giblets %
T1	65.97[b]	0.54	2.41	2.65	5.60
T2	61.88[d]	0.50	2.73	2.13	5.36
T3	69.97[a]	0.55	2.88	2.81	6.24
T4	63.91[c]	0.46	3.11	2.48	6.05
Standard error	±0.589	±0.030	±0.196	±0.179	±0.322
P value	0.0001	0.244	0.157	0.121	0.308

a, b, c and d Means in each column, with same superscripts are not significantly different., G: glucose.

T1: control fed basal diet without glucose syrup. T2: control fed diet incorporated with 5% glucose syrup during first 4weeks. T3: inject egg with 0.1ml G 2.5%+5% glucose syrup during first 4 weeks, T4: inject egg with 0.1ml G 5%+5%glucose syrup during first 4 weeks.

Table (6): Effect of egg injection and early nutrition with glucose on lymphoid organs of Fayoumi chicks (Exp.2).

Treatments	Thymus %	Bursa %	Spleen %
T1	0.19	0.22^{b}	0.29^{b}
T2	0.25	0.26^{a}	0.35^{a}
T3	0.20	0.19^{b}	0.36^{a}
T4	0.17	0.20^{b}	0.31^{ab}
Standard error	±0.021	±0.011	±0.016
P value	0.225	0.014	0.041

a and b Means in each column, with same superscripts are not significantly different., G: glucose

T1: control fed basal diet without glucose syrup. T2: control fed diet incorporated with 5% glucose syrup during first 4weeks. T3: inject egg with 0.1ml G 2.5%+5% glucose syrup during first 4 weeks, T4: inject egg with 0.1ml G 5%+5%glucose syrup during first 4 weeks.

Table (7): Effect of egg injection and early nutrition with glucose on blood constituents of Fayoumi chicks (Exp.2).

Treatments	**Glucose (mg/dl)**	**Triglycerides (mg/dl)**	**Total cholesterol (mg/dl)**	**HDL-c (mg/dl)**	**LDL-c (mg/dl)**
T1	232.0	45.00	148.0	85.33	62.66^{a}
T2	235.7	46.66	141.7	83.66	58.00^{a}
T3	232.3	47.33	145.0	94.33	50.66^{b}
T4	235.5	47.00	144.0	88.00	56.00^{ab}
Standard error	2.02	1.40	1.98	3.82	1.92
P value	0.496	0.531	0.117	0.169	0.018

a and b Means in each column, with same superscripts are not significantly different., G: glucose

T1: control fed basal diet without glucose syrup. T2: control fed diet incorporated with 5% glucose syrup during first 4weeks. T3: inject egg with 0.1ml G 2.5%+5% glucose syrup during first 4 weeks, T4: inject egg with 0.1ml G 5%+5%glucose syrup during first 4 weeks.

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الملخص العربى

التغذية الجنينية والمبكرة بالجلوكوز وتاثيرهما على تحسين الفقس والاداء الانتاجى لكتاكيت الفيومى

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تم اجراء تجربتين لدراسة تاثير التغذية الجنينية بالجلوكوز (التجربة الاولى) لتحسين نسبة الفقس ووزن البداية وذلك عن طريق استخدام 300 بيضة مخصبة لسلالة الفيومى. تم تقسيم البيض الى 5 معاملات بكل منها 60 بيضة (20 بيضة/مكرر). فى اليوم 18 من التحضين تم حقن البيض فى الغرفة الهوائية كالاتى: المجموعة الاولى (كنترول سالب) بدون حقن و المجموعة الثانية تم ثقبها فقط والمجموعة الثالثة حقنت بماء مقطر معقم والمجموعتين الرابعة والخامسة حقنت ب 0,1 ملليلتر جلوكوز بتركيزى 2,5% و 5% على التوالى. اظهرت النتائج تحسن نسبة الفقس ووزن البداية معنويا بمعدل 14,71% ، 5,68% على التوالى فى المجموعة التى حقنت ب 0,1 ملليلتر جلوكوز بتركيز 2,5% مقارنة بمجموعة الكنترول السالب (بدون حقن). فى التجربة الثانية: استخدم عدد 120 كتكوت فيومى غير مجنس عمر يوم حيث تم تقسيمهم الى 4 معاملات بكل منها 3 مكررات (10 طائر/مكرر) كالاتى: المجموعة الاولى (مجموعة المقارنة) تغذت على عليقة قاعدية بدون شراب الجلوكوز. بينما اختيرت الثلاث مجاميع الباقية من التجربة الاولى كالاتى: مجموعة الكنترول السالب و المجموعتين التى تم حقنهم ب 0,1 ملليلتر جلوكوز بتركيزى 2,5 % و 5%. وتم تغذية هذه الثلاث مجاميع على عليقة تحتوى على 5 % شراب الجلوكوز كمصدر سهل للكربوهيدرات خلال فترة البادى (1-28 يوم) تم تحولت للتغذية على العليقة القاعدية حتى 56 يوم. اوضحت النتائج ان التحسن فى وزن البداية استمر حتى نهاية فترتى البادى (28 يوم) والنامى (56 يوم) للمجموعة التى حقنت بالجلوكوز 2,5% وتغذت على عليقة بها شراب الجلوكوز. ايضا تحسن معامل التحويل الغذائى خلال الفترة الكلية (1-56 يوم) بمعدل 10,23% لنفس المجموعة مقارنة بمجموعة المقارنة . لم تتاثر صفات الذبيحة باى من المعاملات المختلفة فيما عدا نسبة الذبيحة والتى زادت معنويا فى المجموعة التى تغذت على عليقة بها شراب الجلوكوز وسبق حقنها ب 0,1 ملليلتر جلوكوز 2,5%.

الخلاصة: حسنت التغذية الجنينية بالجلوكوز بتركيز 2,5% من نسبة الفقس ووزن الفقس لكتاكيت الفيومى بالاضافة لتحسين الاداء الانتاجى للنسل الناتج عند التغذية على علائق بها شراب الجلوكوز بدون التاثير السلبى على جلوكوز ودهون الدم.