

## DEVELOPMENT OF NOVEL METHOD FOR THE ESTIMATION OF TOTAL EGG GLUCOSE IN CHICKEN EGGS

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### SUMMARY

The present study was conducted to determine total glucose in chicken eggs spectrophotometrically. The study was carried out on 24 healthy layer birds of Dahlem Red breed. Total 45 egg samples were randomly collected fresh in the morning. Total glucose was estimated by colorimetric method. The pure yolk and albumen were separated carefully and determined enzymatically for glucose estimation. The method is simple, accurate, specific, rapid and newly evaluated. The average glucose content of Dahlem Red was  $158.82 \pm 6.55$  mg/egg. Earlier the glucose in chicken eggs was determined by using a Free Style Lite electronic glucose measuring device and no other methods were available for the estimation of total glucose in chicken eggs. So, this method is evaluated to estimate total glucose in chicken eggs which is suitable.

**Keywords:** Dahlem Red, eggs, glucose, spectrophotometric

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An avian egg is a highly integrated biological system. Egg is source of protein, liposoluble vitamins A, D, E, K, vitamin B-complex such as cyanocobalamin, thiamine, riboflavin, niacin and pyridoxine. Among minerals; it contains iron, calcium, potassium, sodium, phosphorous and zinc. Egg yolk has high concentration of lipids. Egg is important item in human diet because of its nutritive value and functional properties. Eggs and egg products form an integral part of the food chain. It is the only animal protein source in developing countries that is available to the general population. Egg is an important source of cholesterol and 11unsaturated fatty acids, mainly oleic acid (Aquino *et al.*, 2010). Egg also contains glucose.

Dahlem red is an egg purpose breed of chickens which is imported to India from Germany. It lays tinted eggs and is red-feathered with good immune competence and egg weight (Kundu *et al.*, 1999). Because of the coloured plumage and brown colour of the egg it gained more importance for rural poultry production and for free-range conditions and is now being utilized as a female line for producing egg type chicken (Panda *et al.*, 2012). The present study is focused on determining total egg glucose in chicken eggs.

Till date no proper methods were available for estimating total glucose in chicken eggs so it is an important area of interest as the amount of glucose present in chicken egg is directly linked to development of chick embryo and also tells how much glucose will be available to human consumption in an egg. High performance liquid chromatography and gas chromatography methods are time consuming and sophisticated so, total glucose was

estimated by a spectrophotometric method which is less time consuming and easy.

Total twenty four healthy layer birds of Dahlem Red breed were reared in separate pens with nest boxes under deep litter system and were offered standard layer feed (Crumegg-1) and ad libitum drinking water. Forty five egg samples were randomly collected fresh in the morning.

The egg was broken on a flat surface and was allowed to stand for five minutes. Carefully albumen and yolk were separated and yolk was transferred and rolled on Whatmann filter paper No. 1 to remove all the sticking albumen residues and chalazae. The albumen after separation was poured in graduated beaker and then, the yolk membrane was ruptured with rat tooth forceps and the pure yolk was poured into another graduated beaker. Volume of albumen and yolk were recorded. The sample solutions were prepared by diluting 100  $\mu$ l of yolk sample with 900  $\mu$ l of distilled water and by diluting 500  $\mu$ l of albumen sample with 4500  $\mu$ l of distilled water. Both the samples were separately mixed well in their respective test tubes using a vortex mixer. From diluted samples 20  $\mu$ l of yolk and 20  $\mu$ l of albumen samples were taken separately for estimation.

Total glucose was determined by enzymatic colorimetric method (glucose oxidase peroxidase method) (Trinder, 1969; Kalpan and Lavernel, 1983; Kalpan, 1984; Young, 1997 and Sacks, 1999) using commercial kit for glucose analysis (Autospan Gold Span; Congent Diagnostic, Span Diagnostic Limited, GIDC, SACHIN 394 230 (Surat), Gujarat, India).

The procedure used was as per the procedure

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supplied with commercial kit. Glucose estimation kit contained two types of reagents. The first reagent contained phosphate buffer- 100 mM/L, glucose oxidase- >15000 U/L, peroxidase- >1600 U/L and 4-aminoantipyrine- 0.28 mM/L. The second reagent contained phenol- 10 Mm/L. A working solution was prepared by dissolving the contents of the first reagent with contents of the second reagent in equal volumes. The standard solution was prepared by mixing 1.5 ml of working reagent with 20 µl of glucose standard which was provided in the kit. The test solutions were prepared with 1.5 ml of working reagent each in 20 µl of egg yolk and 20 µl of albumen samples. The blank was prepared by taking 1.5 ml of working reagent. The blank, standard and test solutions were incubated at 37 °C for 10 minutes followed by addition of 1.5 ml distilled water to each. Total glucose was estimated by recording absorbance of standard, test against blank at a wave length of 505 nm in a spectrophotometer (Spectrophotometer GS5705, Ika, Electronic Corporation of India Ltd.). Thus, mg/ml glucose in egg yolk and albumen were estimated by multiplying with the dilution factor. Finally, yolk and albumen values were added to obtain total glucose in mg in an egg. The results obtained were analyzed by suitable statistical methods for calculating mean ± standard error.

The average total egg glucose content in Dahlem red eggs was 158.82±6.55 mg/egg and the values of total egg glucose ranged from 75.84 to 265.21 mg/egg. Blood glucose range is regulated but it may increase. Similarly, this can be noticed with egg glucose range as it can also be increased. There may be a bigger range in egg glucose just as in blood glucose. To support this more studies are warranted. Many biomolecules are in narrow range and they need further investigation. The glucose content in most of eggs is not estimated and same is true for this breed also. Aslam *et al.* (2013) reported the value of egg glucose by using a Free Style Lite electronic glucose measuring device as 1.62 mg/ml or 75 mg/egg in chicken eggs which was lower than the present observed values. Jeyamala and Thangadurai (2018) reported carbohydrate value by Anthrone method in village hen and broiler hen as 41.52±2.50 mg/egg and 99.72±2.87 mg/egg, respectively which were lower than the present observed values. Relevant data is made but much was not available.

The results concluded that the value of total glucose obtained by this methodology was accurate, specific and reliable. The method used was an enzymatic method which was fully automated unlike other spectrophotometric methods like Folin-Wu method which is a cumbersome method. Gluconometer is used for the estimation of blood glucose and no specific devices are available for estimation of egg glucose and neither available device are modified for the purpose. Hence, the method used is superior. Such information will be helpful to the consumers for the consumption of better quality eggs as well as helpful to farmers to compare and choose suitable breed for poultry farming under rural system and for better marketability of eggs.

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