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## Effect of black cumin supplementation on egg yolk lipid profile of birds

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**Abstract**

The present study was aimed to assess the effect of black cumin (*Nigella sativa*) oil on egg-yolk lipid profile of adult layer birds. Twenty four 40-weeks-old Jabalpur color birds were fed on 4 dietary treatments. Birds were caged individually and diets were supplemented with 0 (control), 250, 500 and 750 mg black cumin oil/kg of feed in group T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> respectively for 56 days. Egg yolk lipid profile was estimated on 0, 14, 28, 42 and 56<sup>th</sup> day of feeding. The variation in egg-yolk total lipids, cholesterol and triglycerides between intervals within treatment were highly significant ( $P < 0.01$ ). The study revealed that supplementation of black cumin oil @ 750 mg kg<sup>-1</sup> feed is most effective in reducing the egg yolk lipid profile in Jabalpur color birds fed for a period of 56 days.

**Keywords:** Black cumin oil, Egg yolk cholesterol, Egg yolk total lipid, Egg yolk triglycerides, Jabalpur color birds

**1. Introduction**

Egg is a rich source of all the essential amino acids, minerals and vitamins. Further, it contains about 200-250 mg cholesterol<sup>[1]</sup> which is considered as a major source of dietary cholesterol. Egg lipids account about 30% of the fresh weight of the yolk. The fatty acid composition of egg lipids in laying hens may predictably be influenced by the fatty acid composition of diet<sup>[2]</sup>. Liver of layer birds produces most of the lipids found in egg-yolk since the lipids are transported to ovary by serum lipoproteins<sup>[4]</sup> therefore a decrease in serum lipid concentration may lead to decrease in egg-yolk lipids. The cumin (*Nigella sativa*) seeds, when administered orally to rats, have been shown to lower serum cholesterol and triacylglycerol concentrations<sup>[5]</sup>. The feeding of powdered black cumin seeds to laying hens has been shown to lower serum cholesterol and triacylglycerol concentrations, which indeed was associated with a decrease in egg yolk cholesterol contents<sup>[5]</sup>. On the basis of research findings conducted by<sup>[5]</sup> on the effect of black cumin on egg-yolk lipids in laying hens provoked us to perform the present study on the effect of feeding diets either without or with full black cumin on the concentrations total lipids, cholesterol and triacylglycerols in egg yolk obtained from laying hens. Production of low cholesterol eggs will not only increase the economy of poultry industry but also enhance the consumption of such eggs by the health conscious consumers. On this view the present study was aimed to assess the effect of black cumin oil on egg-yolk lipid profile of adult layer birds.

**2. Materials and methods**

The proposed research was carried out in the Department of Veterinary Physiology and Biochemistry, College of Veterinary Science and Animal Husbandry, N.D.V.S.U., Jabalpur (M.P.). Jabalpur is located at latitude 23°10'N and longitude 79°56'E at an altitude of 411 meters in central India. It has a humid subtropical climate, typical of North-Central India.

**2.1 Birds and husbandry**

Birds were procured from All India Coordinated Research Project (AICRP) on Poultry Breeding, Adhartal, Jabalpur. Birds were kept separately in individual cages and maintained under similar hygienic conditions at Poultry Farm Adhartal. The cages were cleaned, washed and disinfected and complete house was fumigated using formaldehyde and potassium permanganate four days prior to start of the experiment. Feeders and waterers were carefully cleaned with detergent. Duration of experiment was six months.

## 2.2 Diets and measurements

The study was conducted on 24 healthy Jabalpur color birds of 40 weeks age. Birds were randomly divided into 4 groups having 6 birds each. Group T<sub>1</sub> was kept as control, whereas treatment groups T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were taken as experimental ones. Diet of the birds of trial groups was supplemented with black cumin oil @ 250, 500 and 750 mg/kg of diet respectively. Six eggs were collected from each group on days 0, 14, 28, 42 and 56 of the experiment. Egg yolk total lipids were extracted by the method of [6] and estimated by the method of [7] whereas egg yolk cholesterol and triglycerides were estimated by the standard diagnostic kits (Erba).

## 2.3 Statistical analysis

The data obtained was analyzed using hierarchical analysis of variance [8]. Comparisons among the treatment means were made by Duncan's multiple range test (DMRT) [9].

## 3 Results and discussion

### 3.1 Egg yolk lipid profile

The variations in egg yolk total lipids and cholesterol between intervals within treatments were highly significant ( $P < 0.01$ ) whereas those between treatments within a group was significant ( $P < 0.05$ ). The variations in egg yolk triglycerides between intervals within treatments were also highly significant ( $P < 0.01$ ) whereas those between treatments within a group were non-significant. The reduction in egg yolk total lipids was 16.04% in group T<sub>2</sub> whereas it was 20.23% in group T<sub>3</sub> and 31.22% in group T<sub>4</sub> on day 56 of the experiment (Table 1). No significant change was observed in control group T<sub>1</sub>. Similar pattern of reduction (14%) in egg yolk total lipids was reported by [10] on dietary supplementations of black cumin seed of feed in adult White Leghorn birds.

The percentage reductions in egg yolk cholesterol (Table 2) were 11.97 in group T<sub>2</sub>, 21.73 in group T<sub>3</sub> and 27.36 in group T<sub>4</sub> on day 56 of the experiment. [11] Reported significant reduction ( $P < 0.01$ ) in egg yolk cholesterol levels in Lohmann Brown laying hens 36 weeks of age after administration of black cumin seed. Significant ( $P < 0.05$ ) decrease in egg cholesterol was also reported by [5, 12]. Like egg yolk total lipids and cholesterol, triglyceride values were also reduced in the birds fed with all the preparations in all the treatments in a dose dependent manner. The reduction was 10.75% in group T<sub>2</sub> whereas the values were 15.99% in group

T<sub>3</sub> and 19.46% in group T<sub>4</sub> on day 56 of the experiment (Table 3) [10]. Observed reduction of 21% and 23% in egg yolk triglycerides in White Leghorn on supplementation of black cumin.

Feeding black cumin caused significant reductions in the concentrations of egg yolk triacylglycerols and phospholipids. It could thus be the reason that the decrease in serum lipids had caused a decrease in egg yolk lipids. It is not known how black cumin lower the contents of triacylglycerols and phospholipids in serum, but the possible reason may be that component of the black cumin inhibits in the liver the flux of acetyl-CoA into the lipogenic pathway. Such an effect would also dampen cholesterol synthesis [5]. Reported that inclusion of black cumin seeds in the diet to a level of 1.5% raised hen-day egg production from 59 to 77%. In contrast, in this study treatment with black cumin decreased the rate of egg production by up to 16%. The discrepancy may be explained by the fact that the lowering of egg-yolk cholesterol after feeding black cumin seeds was much greater in this study than in that reported earlier by [5].

## 4. Conclusion

The present investigation was undertaken to elucidate the effect of black cumin oil on the egg yolk lipid profile of Jabalpur color birds. It was concluded from the study that the black cumin oil at the dose rate of 750 mg/kg of the diet showed a highly significant effect ( $P < 0.01$ ) on reducing the egg cholesterol level on day 56 of the experiment as compared to other groups supplemented with 250 mg, 500 mg of black cumin oil in the diet and as compared to control group also. The feeding of powdered black cumin seeds to laying hens has been shown to lower serum cholesterol and triacylglycerol concentrations, which indeed was associated with a decrease in egg yolk cholesterol contents. So that it can be effectively used for reducing total lipids, cholesterol and triglyceride contents in the egg yolk of poultry birds and increases the economy of the poultry industry. It may be deduced from the study that egg can be consumed safely without the risk of cardiovascular diseases.

## 5. Acknowledgement

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**Table 1:** Egg yolk total lipids (mg g<sup>-1</sup>) in Jabalpur colour birds fed with diets supplemented with black cumin oil.

Black cumin oil supplementation (mg kg <sup>-1</sup> )	Feeding period (days)					Mean
	0	14	28	42	56	
T <sub>1</sub>	347.08 ±2.69	345.26 ±1.55	344.17 ±1.23	344.71 ±0.86	343.44 ±3.09	344.82 ±1.88
T <sub>2</sub>	317.64 <sup>a</sup> ±1.11	306.57 <sup>b</sup> ±1.79	290.29 <sup>c</sup> ±0.79	273.77 <sup>d</sup> ±1.22	266.68 <sup>d</sup> ±0.91	290.99 ±1.16
T <sub>3</sub>	316.21 <sup>a</sup> ±1.95	303.99 <sup>b</sup> ±2.48	286.97 <sup>c</sup> ±2.74	273.89 <sup>d</sup> ±3.81	252.56 <sup>e</sup> ±2.59	286.72 ±2.71
T <sub>4</sub>	315.55 <sup>a</sup> ±2.72	292.28 <sup>b</sup> ±2.37	267.88 <sup>c</sup> ±2.62	226.38 <sup>d</sup> ±3.39	217.02 <sup>e</sup> ±1.83	263.82 ±2.58
Mean	324.12 ±2.11	312.02 ±2.05	297.32 ±1.84	279.68 ±2.32	269.92 ±2.10	296.60 ±2.08

Values are expressed as mean ± SE (n=6)

Mean values with different superscripts in a row vary significantly ( $P < 0.01$ ).

**Table 2:** Egg yolk cholesterol (mg g-1) in Jabalpur colour birds fed with diets supplemented with black cumin oil.

Black cumin oil supplementation (mg kg <sup>-1</sup> )	Feeding period (days)					
	0	14	28	42	56	Mean
T <sub>1</sub>	18.43 ±0.19	18.48 ±0.31	18.31 ±0.19	18.31 ±0.12	18.11 ±0.23	18.32 ±0.21
T <sub>2</sub>	17.71 <sup>a</sup> ±0.15	17.65 <sup>a</sup> ±0.11	17.03 <sup>ab</sup> ±0.12	16.52 <sup>b</sup> ±0.11	15.59 <sup>c</sup> ±0.06	16.90 ±0.11
T <sub>3</sub>	17.44 <sup>a</sup> ±0.13	16.64 <sup>b</sup> ±0.12	15.76 <sup>c</sup> ±0.22	15.13 <sup>c</sup> ±0.27	13.65 <sup>d</sup> ±0.14	15.72 ±0.17
T <sub>4</sub>	17.62 <sup>a</sup> ±0.27	17.29 <sup>a±</sup> 0.26	16.11 <sup>b</sup> ±0.19	15.09 <sup>c</sup> ±0.25	12.80 <sup>d</sup> ±0.21	15.78 ±0.23
Mean	17.80 ±0.18	17.51 ±0.20	16.80 ±0.18	16.26 ±0.18	15.03 ±0.16	16.68 ±0.16

Values are expressed as mean ± SE (n=6)

Mean values with different superscripts in a row vary significantly ( $P < 0.01$ ).

**Table 3:** Egg yolk triglyceride (mg g-1) in Jabalpur colour birds fed with diets supplemented with black cumin oil.

Black cumin oil supplementation (mg kg <sup>-1</sup> )	Feeding period (days)					
	0	14	28	42	56	Mean
T <sub>1</sub>	182.63 <sup>b</sup> ±1.33	182.81 <sup>b</sup> ±3.60	184.55 <sup>a</sup> ±4.19	181.66 <sup>b</sup> ±4.16	182.38 <sup>b</sup> ±2.04	182.80 ±3.06
T <sub>2</sub>	185.96 <sup>a</sup> ±0.94	181.20 <sup>b</sup> ±0.92	176.71 <sup>c</sup> ±1.15	171.09 <sup>d</sup> ±1.34	165.96 <sup>e</sup> ±1.79	176.18 ±1.22
T <sub>3</sub>	181.01 <sup>a</sup> ±1.06	176.83 <sup>b</sup> ±1.15	171.79 <sup>c</sup> ±1.46	161.41 <sup>d</sup> ±1.48	152.07 <sup>e</sup> ±0.70	168.62 ±1.17
T <sub>4</sub>	185.94 <sup>a</sup> ±1.13	179.48 <sup>b</sup> ±2.19	170.34 <sup>c</sup> ±2.79	160.63 <sup>d</sup> ±1.95	149.76 <sup>e</sup> ±0.98	169.23 ±1.81
Mean	183.88 ±1.11	180.08 ±1.96	175.84 ±2.39	168.69 ±2.23	162.54 ±1.37	174.20 ±1.81

Values are expressed as mean ± SE (n=6)

Mean values with different superscripts in a row vary significantly ( $P < 0.01$ ).

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