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COMPARATIVE EFFECT OF SYNTHETIC PIGMENT AND MARIGOLD FLOWER PETALS ON REPIGMENTATION OF SHANK, VENT AND ECONOMICS OF CHICKEN EGGS

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Abstract: The re-pigmentation of shank and vent at 0 day showed non-significant effects. At 6th and 12th showed the significant ($P<0.05$) differences among the treatment groups The net profit obtained per egg after selling the egg @ Rs. 3/- per egg for treatment group viz; control A, B, C, D and E were Rs. 0.28, 0.27, 0.24, 0.26 and 0.23, respectively. It is recommended that supplementation of synthetic pigment and marigold flower petals with and without antioxidant through feed is beneficial in respect of yolk pigment coloration, re-pigmentation of shank and vent; oxidative stability of eggs during storage and thereby improving shelf life of eggs. The value addition of eggs with respect to enrichment of antioxidant property can be brought with marginal cost of production of eggs.

Keywords: Marigold flower petals, re-pigmentation, shank, synthetic pigments, vent.

Introduction

Egg yolk colour is an important factor for egg marketing in several countries. Yolk pigments are relatively stable and normally are not lost or changed in cooking. The degree of yolk colour is an important creation for table eggs for consumption as well as for manufacturer of egg containing market food products. The visual yolk color perceived by the consumer is the result of the deposition and colouring capacity of oxycarotenoids, called xanthophylls, in the egg yolk. Sources of xanthophylls can be natural or synthetic. They can be mono, dihydro or poly-oxalates. Some xanthophylls such as lutein and zeaxanthin are present in common feedstuffs viz; corn, dried distillers' grains or alfalfa. However, layer diets based on cereals other than corn require pigment supplementation to achieve desired egg yolk colour [4] due to the high variability in pigment content of feedstuffs.

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Yolk pigments include carotene and riboflavin found 0.02% in chicken egg based on the dry weight. Carotenes are responsible for the colour of yolk and cannot be synthesized by hen. The hen's feed is responsible for carotene contents and the colour of the egg yolk. Egg yolk pigment classified as xanthophylls and carotene. The egg yolk colour is the result of deposition and colouring capacity of xanthophylls in the yolk. In order to improve yolk colour, both natural and artificial colour additives are used in hen's diet.

Materials and method

Experimental design

The experiment was carried out on 240 layer birds for a period of 12 weeks from 12/02/2013 to 12/05/2013 in department of Poultry Science, College of Veterinary and Animal Sciences, MAFSU, Parbhani. The experimental design used in present study for housing the layers is presented in Table 1.

Selection of Birds

A total 240 birds were used in experiment of BV-300 strain purchased from M/s. Venkateshwara Hatcheries Pvt. Ltd, Pune. Birds were reared on California cage housing system. The experimental birds were selected randomly on body weight basis when the flock had attained 85% egg production at 62 weeks of age. The birds were randomly distributed into five treatments groups viz. A, B, C, D and E with four replicates of 12 hens each.

Housing and Management

The birds were reared on three tiers california housing system. All the groups were provided with similar environmental and managemental conditions. Ideal and adequate floor space was allotted to all the birds. Feeder and drinker troughs were placed adjacent to the cages running throughout the length outside the cage. 17 hours of light and seven hours of darkness was provided to the birds throughout the experimental period of 12 weeks. As per the day length, artificial light was provided to meet the requirement of 17 hours of light including day light. As birds were in open housing system, environmental conditions varied according to the seasons. The birds were having access to fresh, clean and wholesome water throughout experimental period. The birds were observed at least three times a day to check the health status, mortality was recorded daily. The experimental birds were dewormed at regular intervals. The birds were vaccinated as per schedule of vaccination in layer birds.

Marigold flower petals

Marigold flower petals powder was prepared from drying marigold flower purchased from local market. It was supplemented @ 50 gms per tonne in layer mash for treatment groups B and C throughout experimental period.

Synthetic Pigment

Synthetic pigment Rovimix Carophyll[@]Yellow 5%was procured from DSM nutritional products India Pvt. Ltd., Thane, Maharashtra and added @ 50 gm per tonne of layer mash in treatment groups D and E throughout the experimental period.

Antioxidant

Butylated hydroxyl toluene (BHT) was purchased from local market and added in the feed @ 150 ppm per kg in combination with marigold flower petals and synthetic pigment of layer mash in treatment groups C and E, respectively, throughout the experiment.

Feed

The required quantity of feed ingredients used in the present experiment were purchased from local market and rations were prepared as per [2] at Feed Mixing Plant, College of Veterinary and Animal Sciences, MAFSU, Parbhani and was offered to the birds throughout experiment Table 2.

Feeding and watering schedules

The layers were fed with the layer mash containing 17.75 % crude protein and ME 2640 Kcal to meet nutrient requirement. A total of 115 gm of layer mash per bird was offered. Every attempt was made to minimize feed wastage. Fresh and clean water was made available to the birds at all times.

Re-pigmentation of shank and vent

Re-pigmentation of shank and vent was carried out by visual and photographic observations by means of colour graduated visual aid (Roche colour fan). The Roche colour fan was used at 0 day, 6^{th} week and 12^{th} week of laying to measure the shank and vent pigmentation. 3 hens per replicate groups were selected as a measure of re-pigmentation.

Economics of egg production

The economics of egg production of the experiment was worked out by considering the prevailing prices of input &output in the market. The cost of feed & other overheads was considered while calculating the cost of production. However the labour cost was not considered as the experiment was conducted by student.

Results and discussion

Re-pigmentation of Shank

The data pertaining to re-pigmentation of shank of the birds from different treatment groups at 0 day, 6th and 12th week are presented in Table 3. The same depicted graphically in Figure 1. It is observed from Table 3 that the values of re-pigmentation of shank at 0 day from different treatment groups were non-significant. However, the values of re-pigmentation at 6th week were highly significant as per analysis of variance. The mean values for re-pigmentation of shank of birds supplemented with synthetic pigment and marigold flower petals with and without antioxidant differed significantly than that of un-supplemented group (Group A) at 6th and 12th week. However, among supplemented group the differences were non-significant except treatment group E at 12th week.

Re-pigmentation of vent

The data pertaining to re-pigmentation of vent of the birds from different treatment groups at 0 day, 6th and 12th week are presented in Table 4. The same depicted graphically in Figure 2. It is observed from the table that the values of re pigmentation of vent at 0 day from different treatment groups were non-significant. It is obvious, before supplementation of pigmenting agent there were no differences. However, after supplementation of pigment agents at 6th week and 12th week, highly significant differences were observed in the mean values for re-pigmentation of vent of birds supplemented with synthetic pigment and marigold flower petal with and without antioxidant than those of unsupplemented group (group A). Similar finding were observed by [3]. They revealed that shank pigmentation value found statistically different between treatment groups supplemented with 25% of Marigold in the ration.

Economics of egg production

The data pertaining to economics of egg production are presented in Table 5. The same is depicted graphically in Figure 3.It is observed from the Table that cost of production per egg was Rs. 2.72 for treatment group A followed by 2.73 for treatment group B, 2.76 for treatment group C, 2.74 for treatment group D and 2.77 for treatment group E. It is obvious the net profit of treatment group A (control) is higher as it is without any value addition. By supplementation of synthetic pigment and marigold flower petals with and without addition of antioxidant had not affected significantly net profit per eggs. However, treatment group E had lowest net profit (0.23 per eggs). It is concluded the value added eggs with pigmentation and enrichment in oxidative property are produced with marginal decreased net profit compared to un-supplemented eggs. There is scanty literature available on economics of egg

production pertaining to supplementation of synthetic pigment and marigold flower petals with and without antioxidant. However, [1] reported that feed cost was reduced when cassava root meal completely replaced with maize in layer ration.

Conclusion

Significantly higher values and photographical observations of pigment in shank and vent clearly indicate rapid deposition of pigment in shank followed by vent. The effect of pigment deposition is more intensified with supplementation of synthetic pigmentation with and without antioxidant compared to supplementation of marigold with and without antioxidant.

From economics of egg production it is concluded that supplementation of synthetic pigment and marigold flower petals with and without antioxidant increased marginal cost of production. The value added eggs with pigmentation and enrichment in oxidative property are produced with marginal decreased net profit compared to eggs obtained from unsupplemented groups.

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Table 1. Experimental groups with supplementation of the synthetic pigment and marigold flower petals with and without antioxidant

Group	Treatment	Replicate	No. of Birds
1	Control A-Basal diet	4	48
2	Group B- Basal diet + marigold petals @ 50gms/ tonne of feed	4	48

3	Group C- Basal diet + marigold petals @ 50gms/ tonne of feed) + Butylated hydroxy toluene (BHT) @ 150 ppm/kg feed.	4	48
4	Group D- Basal diet + Synthetic pigment @ 50gm/tonne of feed	4	48
5	Group E- Basal diet + Synthetic pigment @ 50gm/tonne of feed + Butylated hydroxy toluene (BHT) @ 150 ppm/kg feed.	4	48
	Total	20	**240**

Table 2. Percent ingredients of dietary composition of layer mash used in experimental diet

Ingredients	Ingredient composition
Maize	56
Rice Polish	4
Soya meal	20.5
Ground nut cake	7
Deoiled rice bran	0.95
Dicalcium Phosphate	1.3
Limestone powder	4
Shell grit	5.3
L-Lysine	0.03
DL- Methionin	0.12
Salt Pure	0.25
Sodium bicarbonate	0.1
Choline Cholride	0.1
Phytase PMX	0.1
Liver Tonic	0.025
Toxin Binder	0.1
Trace mineral Mix.	0.1
Vitamin Mixture	0.025
Marigold flower petals	#
Synthetic pigment	#

BHT	#
Crude protein%(calculated)	17.75
Metabolisable energy (Kcal/Kg)(calculated)	2640
ME:P ratio	148.73:1

Marigold petals, synthetic pigment &BHT were incorporated in the treatment groups as described in experimental design.

Table 3. Influence of synthetic pigment and marigold flower petals on shank re-pigmentation

Treatment	Age		
	0 day	6th week	12th week
A	0.250	0.00^{a}	0.00^{a}
B	0.250	1.00^{b}	2.00^{b}
C	0.250	1.00^{b}	2.00^{b}
D	0.250	1.00^{b}	2.00^{b}
E	0.250	1.00^{b}	3.00^{c}
SE ±	0.444	0.768	0.196
CD	0.099	0.172	0.268
CV%	69.73	69.73	69.73

Note: The means connected with similar superscript do not differ significantly from each other.

Table 4. Influence of synthetic pigment and marigold flower petals on vent re-pigmentation

Treatment	Age		
	0 day	6th week	12th week
A	0.250	0.00^{a}	0.00^{a}
B	0.250	0.250^{b}	1.00^{b}
C	0.250	0.250^{b}	1.00^{b}
D	0.250	1.00^{c}	2.00^{c}
E	0.250	0.250^{b}	1.00^{b}
SE ±	0.099	0.131	0.205
CD	0.444	0.587	0.918
CV%	111.80	111.80	111.80

Note: The means connected with similar superscript do not differ significantly from each other.

Table 5: Effect of synthetic pigment and marigold flower petals on economic of egg production

	Group A	Group B	Group C	Group D	Group E
Daily Feed Consumption (Kg)	0.115	0.115	0.115	0.115	0.115
Average feed Consumption per Egg (Kg)	0.134	0.134	0.134	0.134	0.134
Feed Cost Rs. Per Kg (Rs.)	16.35	16.42	16.66	16.50	16.74
Feed Cost Per Egg (Rs.)	2.19	2.20	2.23	2.21	2.24
Grower Cost (Rs.)	0.53	0.53	0.53	0.53	0.53
Cost of Production per Egg (Rs.)	2.72	2.73	2.76	2.74	2.77
Sale of eggs (Rs.)	3.00	3.00	3.00	3.00	3.00
Net Profit (Rs.)	0.28	0.27	0.24	0.26	0.23

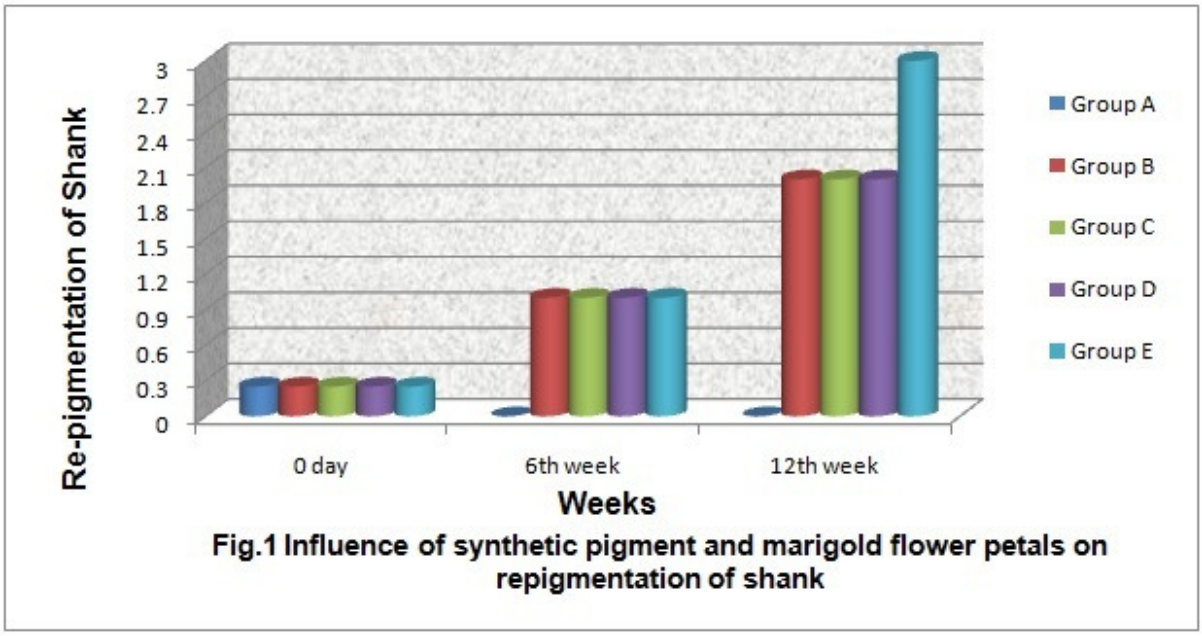

Fig.1 Influence of synthetic pigment and marigold flower petals on repigmentation of shank

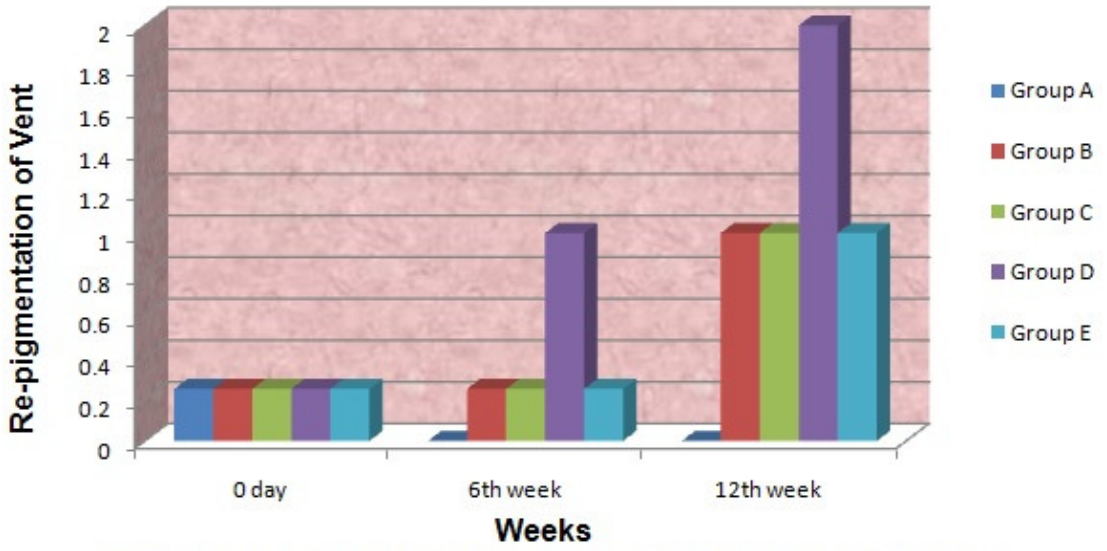

Fig.2 Influence of synthetic pigment and marigold flower petals on repigmentation of vent

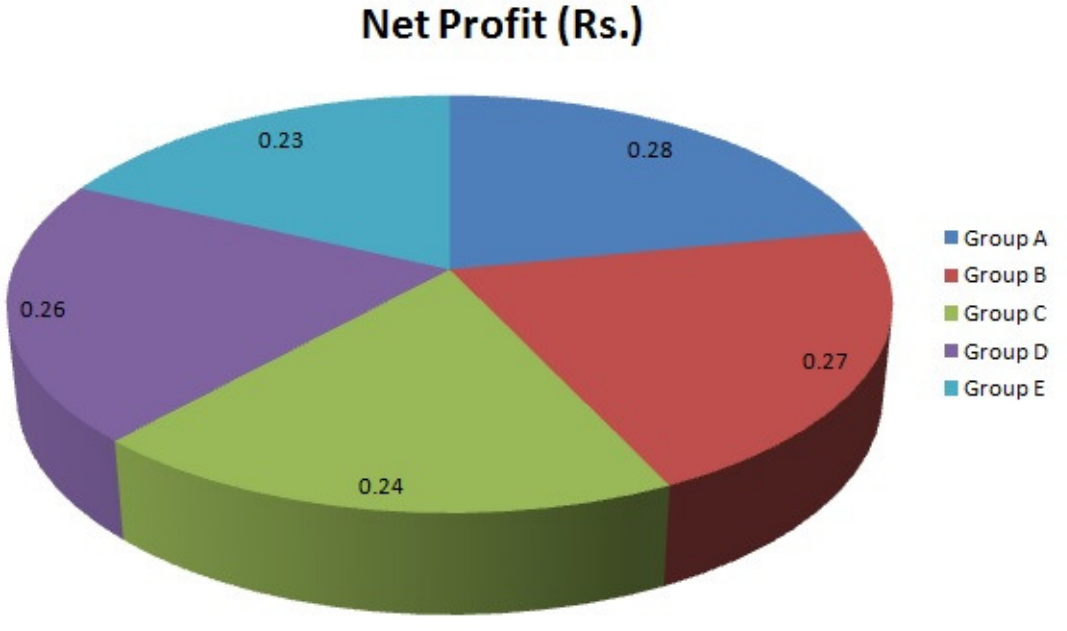

Fig.3 Influence of synthetic pigment and marigold flower petals on cost of production of egg.