Journal Homepage: http://dergipark.gov.tr/ethabd

ETHABD
Erciyes Tarım ve Hayvan Bilimleri Dergisi

DergiPark AKADEMİK

ISSN:2651-5334

Effect of Onion Juice (Allium cepa) on Egg Quality Traits during Different Storage Time in Laying Hens

Aamir Iqbal*, Ismail Bayram

**Department of Animal Nutrition and Nutritional Diseases, Faculty of Veterinary Medicine, Afyon Kocatepe University, Afyonkarahisar, Turkey.*

***sorumlu yazar**: aamir_vet@yahoo.com*

Araştırma Makalesi / Original Article

Yayın Bilgisi

Geliş Tarihi: 13.04.2019

Revizyon Tarihi: 09.01.2020

Kabul Tarihi: 13.01.2020

This paper presented at the 1st International Erciyes Agriculture, Animal & Food Sciences Conferences in Kayseri on 23-27 April 2019

Keywords

Laying hens, Onion juice, Egg storage, Egg quality triats

Abstract

Much importance has been given on the use of phytogenic products to enhance performance and also the quality of fresh eggs but few studies were conducted regarding the impact of plant extracts on storage quality of eggs. The present study was designed with the objective to evaluate the effect of onion juice via drinking water, on different egg quality traits in laying hens at 0, 10, 20 and 30 days storage time intervals. A total of 240 Babcock white laying hens (50 weeks old) were divided into 5 groups (48 birds in each) and each group was further subdivided into 8 replicates, containing 6 birds in each subgroup. . In this study, total five groups such as A, B, C, D and E were added onion juice at the rate of 0 ml/L,, 0.25 ml/L,, 0.5 ml/L,, 1 ml/L, and 2 ml/L, respectively for 4 weeks. Lighting schedule of 16 hours light and 8 hours dark was followed. At the end of the study (90 days), a total of 320 eggs were collected randomly. 80 eggs were analyzed at zero day of storage while other eggs were stored at 4°C temperature for 10, 20 and 30 days. Among these eggs, 80 eggs were analyzed after 10 days and remaining 80 eggs were analyzed respectively after 20 and 30 days of storage. The results revealed that egg quality traits like egg weight, yolk color, haugh unit (HU) shell thickness, albumin index and yolk index showed no positive effect (P>0.05) between and among all the treatment groups as compared with control group at different storage intervals. Diversified research is recommended to explore the onion juice impact on the egg quality traits during prolonged storage periods.

Yumurta Tavuklarında Soğan Suyunun (Allium cepa) Yumurtaların Farklı Depolama Sürelerinde Yumurta Kalitesi Üzerine Etkisi

Anahtar Kelimeler

Yumurta Tavuğu, Soğan Suyu, Yumurta Depolama, Kalite

Özet

Yumurta tavuklarında performans ve yumurta kalitesini arttırmaya yönelik olarak fitojenik ürünlerin kullanılmasına büyük önem verilmekte ve konuyla ilgili birçok çalışma yapılagelmektedir. Ancak bitki ekstraktlarının yumurtaların depolama kalitesi üzerindeki etkisi ile ilgili az sayıda çalışma yapılmıştır. Bu araştırma, yumurta tavuklarında içme suyuna katılan soğan suyunun, 0, 10, 20 ve 30 günlük sürelerle depolanan yumurtalarının bazı kalite özelliklerine etkisini belirlemek amacıyla gerçekleştirilmiştir. Toplam 240 adet 50 haftalık yaşta Babcock beyaz yumurtacı tavuk her birinde 48 adet olmak üzere 5 gruba ayrılmıştır. Deneme grupları ayrıca her birinde 6 adet tavuk bulunan 8 alt gruba ayrılmıştır. Çalışmada deneme grupları içme sularına (A, B, C, D ve E) 12 hafta boyunca sırasıyla 0 ml/L, 0.25 ml/L, 0.5 ml/L, 1 ml/L ve 2 ml/L oranlarında soğan suyu ilave edilmiştir. Araştırmada tavuklara 16 saat aydınlık ve 8 saat karanlık aydınlatma programı uygulanmıştır. Araştırmanın 90. gününde, toplam 320 yumurta gruplardan rastgele toplanmıştır. Toplanan yumurtaların 80 adedi aynı gün analiz edilirken (0. Gün), diğer yumurtalar ise 4 ° C sıcaklıkta 10, 20 ve 30 gün boyunca depolanmıştır. Bu yumurtalardan 80 yumurta 10 gün sonra analiz edilirken, kalan yumurtaların 80 adedi 20. Gün, 80 adedi ise 30 günlük depolamadan sonra analiz edilmiştir. Araştırmadan elde edilen sonuçlara göre, yumurta ağırlığı, yumurta sarısı rengi, haugh birimi (HU), kabuk kalınlığı, albümin indeksi ve yumurta sarı indeksi gibi yumurta kalitesi özelliklerinin, depolama sürelerine göre kontrol grubuyla karşılaştırıldığında, deneme gruplarında pozitif bir etki göstermediği (P> 0.05) tespit edilmiştir. Sonuç olarak, soğan suyunun farklı sürelerle depolama sırasında yumurta kalitesi üzerindeki etkilerinin belirlenmesi için farklı zaman aralıkları ve derinlemesine ilave kalite parametrelerini içeren çeşitlendirilmiş çalışmalara ihtiyaç bulunmaktadır.

1. INTRODUCTION

The rapid globalization has increased the consumer preferences for the high quality food and more demand of the good quality of the protein products. Among the daily protein consumption products, poultry eggs are being widely used. Farmers are advised to adopt such ways by which the shelf life of the livestock end-products is enhanced (FAO, 2015) For this concern animal nutritionist/ researchers are conducting modern techniques; experimenting, devising and introducing them to the livestock sector for enrichment with contemporary management plans. (Ahmad et al., 2013)

Poultry is a big sector of livestock and it is increasing day-by-day as compared to other meat industry because of more market value (Wındhorst et al., 2011) About one-third of meat and eggs produced and consumed all over the world is from poultry (Scanes, 2007) Due to more consumer preferences for the poultry products and as they are ecnomical and easily purchaseable, there is expansion in layers and broliers farming sicnce last decade (Hester, 2005) It is generally advised to develop active poultry research institutes relative to the advancement in poultry farming to augment livestock sector. (Thaxton et al., 2003). Ineffecint poultry feed production and poor quality of feed has led to the malnutrition in poultry industry. Antibiotic residues in poultry meat and eggs (Edens, 2007) has developed antibiotic resistance in consumers (Cj Contreras et al., 2008). Therefore, European Union has banned the antibiotic use in livestock. (Van Boeckel et al., 2015) Instead some alternatives to antibiotics like agricultural by-products (Cheng et al., 2014) leafy vegetable protein concentrates (Agbede & Aletor, 2003) (Onibi et al., 2009) maggot meal (Zhou et al., 2014) and phytogenics are being used by the poultry industry constantly (Gadde et al., 2017). Plant extracts alone or in combination with others are used for improvement of the performance and health of poultry and other livestock animals.For example, Onion has been widely used in polutry as growth promotent and improves the carcass quality (Goodarzi et al., 2013) (Goodarzi & Nanekarani, 2014a)

Onion (Allium cepa) belongs to genus: Allium and family: liliaceae is a renowed medicinal plants used as growth promoters (Fredotovíc et al., 2017) Onion is a bulbous plant. (Marcinčk et al., 2011) It is cultivated all over the world and originated in central Asia (Goodarzi & Nanekarani, 2014a). It is composed of numerous organic sulphur containing compounds (Mathew & Augusti, 1975) The primary sulpur-containing constitutents are S-alkyl-L-cysteine sulphoxides (ACSOs) i.e allicin (Kuete, 2017) and γ-glutamylcysteines are important storage peptides (Goodarzi & Nanekarani, 2014b) and it contains lipid-soluble sulphur compounds, such as diallyl sulphide (DAS), diallyl disulphide (DADS) (Lancaster et al., 1989). According to (Barile et al., 2007) these compounds impart characteristic odour and flavor to onions and various biological properties. The chemical analysis indicates that it also contains S-methyl-cysteine sulfoxide, Spropylcycteine sulfoxides, Trans-S-(1-propenyl) cysteine sulfoxide, and cycloallicin, phenolic acids, saponins, flavinoids, and sterols including cholesterol, b-sitosterol, stigma sterol, sugars and very small amount of volatile oil compounds(Lampe, 1999). Many reserchers like (Christaki et al., 2012) (Lopez-Bote et al., 1998) (O'Hara, 1998) (Lee et al., 2003) (Rahimi et al., 2011) stated the antibacterial, antiviral, antiparasitic, antifungal, antihypertensive, hypoglycemic, antithrombotic, antioxidant, antihyperlipidemicm and antiinflammatory activies of onion juice and onion pulp and other phytogenics like garlic and orange pulp.

In one study, 500 mg/kg of whole pomegranate extract was given to rats in India and anti-depressant effect was noticed in the trial. It has been published that no negative effect was seen on yield parameters after the addition of 5% and 10% levels in drinking water to chicken for one month. (Rahman et al. 2017). Pomegranate seed pulp may be used as potential feed supplement up to 5% for the laying hens and no adverse effect on egg quality and production was reported (Saki et al. 2014: Rahman et al. 2017).

Linseed oil with pomegranate juice was used in broilers for 6 weeks and examination of the adipose tissue, fatty acid profiles, blood parameters, liver enzymes, and serum profiles showed an increase in white blood cells for 0.5% and 1.0% dose group and decrease in the cholesterol level for the group being offered 1.5 % pomegranate with linseed oil (Manterys et al. 2016). Similarly, (Goodarzi et al., 2013) reported that onion juice decrease the triglyceride and total cholesterol level in blood in poultry.

Although onion juice is very helpful for poultry but researchers did not work on this topic too much. The present study was aimed to evaluate the effect of the onion juice at different concentrations on egg quality after storage at 4° C for different periods 0, 10, 20 and 30 days.

2. MATERIAL AND METHODS

This study was conducted at the experimental animal farm of Afyon Kocatepe University under the Project approved by BAPK (15.SAĞ.BİL.23). The ethics committee of faculty of Veterinary Medicine approved the conduct of study under the case AKÜHADYEK-05-18, on 14.02.2018.

Two hundred fourty (240) Babcock white laying hens of 50 weeks old were randomly allocated into 5 treatment groups. Each group consisted of 8 replicates enriched cages with 6 hens each. Treatment groups were as follows: Control group (A) that was offered basal diet and clean drinking water with no supplementation of onion juice, Group B that was supplemented with

0.25ml/L of onion juice in drinking water, Group C was given 0.5ml/L of onion juice, Group D was offered 1.0ml/L of the onion juice and Group D was provided with onion juice at dose of 2ml/L of the drinking water. All diets offered for the 30 days of the trial were isocaloric and isonitrogenous. (Table 1.0) The chemical composition of the onion juice is being expressed in the Table: 2.0. The onion juice was prerared on daily basis by cutting the fresh onion and boiling it in water to make the required concentration and filtering it after colling. The juice was supplemented in fresh drinking water on daily basis and Ad libitum feed and water were provided.The light period of 16 hours along with 8 hours of the dark period was given.

Table. 1

Feed ingredients	Inclusion % (as fed basis)
Corn grain	57.50
Sunflower meal, 32 %hp	15.42
Full fat soya	10.00
Soybean meal, 44%	5.90
Limestone	8.54
Dicalcium phosphate	2.06
Salt	0.25
Vitamin-mineral mix	0.25
L-lysine hydrocloride	0.05
Dl-methıonine	0.03
Calculated values	
Dm	90.5
Cp	16.0
Me.kcal/kg	2750
Ca	3.83
Av.p	0.43
Na	0.14
Met+sis	0.62
Lysine	0.74
Treonin	0.57
Triptophane	0.19
linoleic acid	2.23

1.Providedper kg of diet:Vitamin A:12.000.000 IU, Vitamin D3:3.000.000IU, Vitamin E:35.000, Vitamin K3:3.500,Vitamin B1:2.750IU, Vitamin B2:5.500IU, Nicotinamid: 30.000IU,Ca-D-Panthotenate:10.000IU,Vitamin B6: 4.000IU, Vitamin B12-15IU, Folic acid:1.000IU, D-Biotin: 50IU,Cholin clorid:150.000IU, Manganese: 80.000mg, Iron: 60.000 mg, Zinc:60.000 mg, Copper:5.000 mg, Iodine:2.000 mg, Cobalt: 500 mg, Selenium: 150 mg, Antioxidant:15.000 mg

A total of 320 eggs were randomly collected at the end of the study (30 days), 80 eggs from each group. B (Jin et al., 2011) taking 16 eggs from each group (16*5=80), a total of 4 storage groups were developed at 4° C temperature for 0, 10, 20, 30 days respectively with 80 eggs for each storage group. At the end of the trial 80 eggs were freshly analyzed. Similarly eggs were analysed after the 10 day storage, 20 day storage and 30 day storage at 4° C temperature.

Table: 2.0 Chemical composition of onion

Energy	23-38 Kcal 100 g-1fresh weight
Protein	0.9-1.6 %
Fat	Trace-0.2%
Carbohydrates	5.2-9.0%
Ash	0.6%
Onion juice Ingredients mg/L	
Gallic Acid	2.659
Protocatechuic acid	0.240
Syringic acid	1.208
Vanilic	4.439
Caffeic	40.131
P-coumaric	0.239
Cinnamic	0.388
Gentisic acid	11.699
Epicatechin	24.962

The collected eggs were individually weighed and there weight was taken by 'METTLER TOLEDO' of type: New Classic MF and Model: MS205DU having weighing capacity of 0.01 – 220 grams. Haugh units were determined on each egg with a Haugh meter (Model S-8400, B.C. Ames Inc, and USA). Egg yolk color was estimated with a DSM Yolk Color Fan. Eggshell thickness was measured with a 0.01 mm precision thickness gauge (Peacock, Ozaki MFG. CO. Ltd, Tokyo, Japan), after removal of shell membranes at three locations (sharp, blunt end and equator) and the mean value for each egg was calculated. The Albumin height and width, and yolk height and width was measured by the 'Electronic Digital Caliper' having resolution: 0.1mm/6.10 inches.

Statistical Analysis

Kolmogorov_Smirnov test was used to see the normality distribution of data. Logarithmic transformation was used on the data which did not show normality distribution. For independent variables, one way ANOVA was applied using Post Hoc with Bonferroni and Tamhane's T2 according to equality of variances. For dependent variables, to see statistical differences repeated measures ANOVA was used and post-hoc with Bonferroni and Tamhane's T2 according to equality of variances. To determine significance $P<0.05$ was used. Mean±SEM was showed in tables.

3. RESULTS

Egg weights of differents laying hen groups were statistically non significant ($p>0.05$). The results indicated that onion juice supplementation had no effect on weight of eggs laid by all the laying hen groups as comapred to the control group. (Table 3.0)

Table: 3 Effect of Onion juice on egg weight during 0, 10, 20 and 30 days of storage

Groups	0 Day		10 Day		20 Day		30 Day		p
	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	
A 0.0ml/L	66.150	1.2897	65.310	1.1962	65.993	1.7820	65.669	1.3055	0.969
B 0.25ml/L	64.551	1.1954	64.852	1.5878	64.429	1.3910	66.031	1.4851	0.833
C 0.5ml/L	68.824	1.2593	67.421	1.4348	64.915	1.3344	68.100	1.2668	0.123
D 1.0ml/L	66.709	1.5322	66.497	1.9243	64.659	1.9574	66.275	2.1744	0.857
E 2.0ml/L	66.058	1.4161	63.684	1.2818	64.927	1.6794	65.856	1.1295	0.423
P	0.258		0.445		0.968		0.768		

Egg yolk color was statistically non-significant ($p>0.05$) between different groups. However, there was statistically significant relationship ($p< 0.05$) within the all treatment groups. Moreover, the egg yolk color analysis after the 30 day of storage was increased significantly ($p< 0.05$) as compared to the control group. Yolk color was increased more significantly within the group C that was given 0.5 ml/L of onion juice after the 30 day storage analysis. (Table 4.0)

Haugh unit between the different laying hen treatment groups showed statistically non significant result($p>0.05$) in all treatment groups except after 10 day storage analysis it was decreased significantly between the groups. ($p<0.05$). The results indicated the significant decrease of the haugh unit value within all treatment groups as compared to the control. ($p<0.05$) and it was more significantly decreased in group C and D being supplemented with 0.5 ml/L and 1.0 ml/L respectively as compared to the control. ($p<0.05$) (Table 5.0)

Egg shell thickness of different laying hen treatment groups were statistically non significant ($p>0.05$) between and within the all groups. The results indicated that onion juice supplementation put no significant effect on shell thickness of eggs laid by all the laying hen groups. (Table 6.0)

Egg albumen index was statistically non significant ($p>0.05$) between all the treatment groups. However, egg albumin index was decreased significantly ($p<0.05$) within all treatment groups at all storage intervals as compared to the control group. It was decreased more significantly within the all groups after the 30 day storage analysis. Moreover there was more rapid decrease in the egg albumin thickness in group D supplemented with 1.0 ml/L of onion juice as compared to the control group at all storage intervals. (Table 7.0)

Table: 4 Effect of Onion juice on Yolk colour during 0, 10, 20 and 30 days of storage

Groups	0 Day		10 Day		20 Day		30 Day		p
	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	
A 0.0ml/L	10.875^{A}	0.2437	11.094^{A}	0.2246	11.531^{AB}	0.3044	12.000^{B}	0.2141	***0.025***
B 0.25ml/L	10.719^{A}	0.1824	11.156^{AB}	0.2803	11.375^{AB}	0.2350	12.000^{B}	0.2850	***0.005***
C 0.5ml/L	10.656^{A}	0.3018	10.938^{AB}	0.3472	11.594^{AB}	0.3686	12.250^{B}	0.3476	***0.006***
D 1.0ml/L	11.063^{AB}	0.1434	10.875^{A}	0.3370	11.469^{AB}	0.2680	11.969^{B}	0.3490	***0.013***
E 2.0ml/L	11.438^{AB}	0.1930	11.031^{A}	0.2641	11.531^{AB}	0.2065	11.937^{B}	0.1875	***0.020***
P	0.099		0.942		0.995		0.976		

Table: 5 Effect of Onion juice on Haugh Unit during 0, 10, 20 and 30 days of storage

Groups	0 Day		10 Day		20 Day		30 Day		*p*
	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	
A 0.0ml/L	90.436^{B}	1.4839	89.091^{ABab}	1.3991	87.516^{AB}	1.3208	84.854^{A}	1.2398	***0.032***
B 0.25ml/L	90.148^{B}	1.9516	90.039^{ABb}	1.4164	84.769^{AB}	1.6554	83.838^{B}	2.6297	***0.036***
C 0.5ml/L	90.511^{B}	1.3817	83.237^{ABab}	1.4430	85.633^{AB}	1.4148	80.321^{B}	1.4572	***0.001***
D 1.0ml/L	92.787^{B}	0.8037	83.490^{ABab}	1.7775	86.814^{AB}	1.4201	82.059^{B}	1.8333	***0.001***
E 2.0ml/L	89.354^{B}	1.5525	83.084^{ABa}	2.2431	88.529^{B}	2.2252	80.660^{A}	1.4874	***0.003***
P	0.546		***0.005***		0.563		0.386		

Table: 6 Effect of Onion juice on Eggshell Thickness during 0, 10, 20 and 30 days of storage

Groups	0 Day		10 Day		20 Day		30 Day		*p*
	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	
A 0.0ml/L	0.368	0.007042	0.357	0.009518	0.359	0.008489	0.373	0.006753	0.363
B 0.25ml/L	0.358	0.01202	0.356	0.008754	0.360	0.009265	0.353	0.01063	0.933
C 0.5ml/L	0.388	0.005494	0.364	0.008004	0.358	0.007315	0.351	0.006382	0.130
D 1.0ml/L	0.376	0.007744	0.369	0.005618	0.356	0.008310	0.366	0.009353	0.350
E 2.0ml/L	0.369	0.007846	0.374	0.005313	0.371	0.008086	0.371	0.009507	0.964
P	0.089		0.338		0.769		0.247		

Table: 7 Effect of Onion juice on Albumin Index during 0, 10, 20 and 30 days of storage

Groups	0 Day		10 Day		20 Day		30 Day		*p*
Group	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	
A 0.0ml/L	10.295^{B}	0.4327	9.564^{AB}	0.3811	8.912^{AB}	0.2843	8.321^{A}	0.2984	***0.002***
B 0.25ml/L	10.541^{B}	0.5221	9.889^{AB}	0.4239	9.110^{AB}	0.4762	8.545^{A}	0.5776	***0.007***
C 0.5ml/L	10.108^{BC}	0.3080	8.392^{AC}	0.3710	8.998^{C}	0.2781	7.550^{A}	0.3323	***0.001***
D 1.0ml/L	11.361^{B}	0.3716	8.583^{A}	0.4604	8.539^{A}	0.4257	7.924^{A}	0.4117	***0.001***
E 2.0ml/L	10.235^{B}	0.5151	8.599^{AB}	0.5626	7.912^{A}	0.3667	7.350^{A}	0.3704	***0.001***
P	0.308		0.060		0.154		0.263		

Egg yolk index was statistically non significant ($p>0.05$) between the groups when the eggs were analysed at 0 day while it was statistically decreased significantly ($p<0.05$) between the groups at all other storage intervals i.e 10, 20 and 30 days and more significantly decreased ($p<0.05$) as compared to the control in group D and E supplemented with 1.0ml/L and 2.0ml/L of onion juice. Moreover, between A, B and C groups the results were statistically non-significant whereas in group D and E results were statistically significant. (Table 8.0)

Table: 8 Effect of Onion juice on Yolk index during 0, 10, 20 and 30 days of storage

Groups	0 Day		10 Day		20 Day		30 Day		*p*
Group	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	$\overline{X}$	SEM	
A 0.0ml/L	43.406	0.7027	43.301^{b}	0.8023	42.706^{b}	0.6339	43.016^{b}	0.8451	0.915
B 0.25ml/L	43.690	0.8972	42.433^{ab}	0.4162	41.631^{ab}	0.5104	41.972^{b}	0.4787	0.137
C 0.5ml/L	42.933	0.5967	41.573^{ab}	0.4548	42.334^{b}	0.7936	41.766^{b}	0.3785	0.292
D 1.0ml/L	43.018^{B}	0.6045	40.474^{Aa}	0.5437	39.434^{Aa}	0.5983	38.789^{Aa}	0.5353	***0.001***
E 2.0ml/L	41.786^{B}	0.7250	40.849^{Aa}	0.6257	39.321^{Aa}	0.5138	39.347^{Aa}	0.5947	***0.016***
P	0.414		***0.006***		***0.001***		***0.001***		

4. DISCUSSION

The main aim of the present study was to evaluate the effect of onion juice supplementation in drinking water to laying hens on the egg quality after different storage intervals. Our results indicated that the dietary supplementation improved the egg quality except the egg weight and egg shell thickness, all other parameters indicated the significant results within and between all the groups at 10,20 and 30 day storage intervals. Onion has been known as a source of bioactive phenolic compounds like hesperidina and naringin. Many of these phenolic compounds have drawn attention due to their antioxidant properties to increase the shelf life of the ggs. (Akter et al., 2014). Egg weight result in our study were similar to the results by (Jin et al., 2011) and by (Samli et al., 2005). Egg yolk color was non-significant between different groups as it was reported by (Carranco-Jáuregui et al., 2006) who demonstrated that yolk color was not change during different storage time periods at 4°C. In a trial conducted by (Goliomytis et al., 2018) positive effects of orange pulp on oxidative stability of the eggs were reported due to the hesperidin and naringin found in onion pulp. The researchers (Martinez et al., 2012) reported that these compounds can stop the radical chain reactions due to the lipids of the egg yolk by donating the hydrogen atoms to free radicals. The postive effects on the fresh and stored egg yolk oxidative stability and shelf life has also been reported by (Goliomytis et al., 2018).

(Hong et al., 2012) have also reported the improved antioxidant status of laying hens as a result of dietary supplementation with the aglycon forms of naringin and hesperidin (naringenin and hesperetin, respectively). In our study the Haugh unit was non-significant between the groups except after 10 day storage it was decreased significantly and similarly within the groups it was significanlty decreased. Similar to the present study (Jin et al., 2011) described that in normal fed laying hens, eggs HU did not change at 5°C with increase in storage time. Some other researchers (Samli et al., 2005) (Tona et al., 2004) (Akyurek & Okur, 2009) also reported that HU did not change with increasing storage time. In close agreement with the results of the present study, available literature is also explaining that in normal diet fed laying hens, there is no effect on the storage quality of eggs at 4C temperature, but onion juice at 1.0ml/L and 2.0ml/L is found to be effective in albumin and yolk index, yolk color and haugh unit.

5. CONCLUSION

The result data from the current study indicated that supplementation of onion juice in the laying hen's diet had no significant effect on egg weight and egg shell thickness during storage for 0, 10, 20 and 30 days at 4°C. However, the egg yolk color and haugh unit showed significant effect. Similar to this the albumin and yolk index was also decreased significantly in some groups i.e negative effects were seen. It is recommended to conduct more extensive research studies to explore the effect of this herbal product on egg quality parameters during prolonged storage at higher temperature which are more detrimental to egg quality traits.

ACKNOWLEDGEMENTS

We thanks to the Afyon Kocatepe University BAPK for funding the project.

REFERENCES

Agbede, J. O., & Aletor, V. A. (2003). Evaluation of fish meal replaced with leaf protein concentrate from Glyricidia in diets for broiler - Chicks: Effect on performance, muscle growth, haematology and serum metabolites. International Journal of Poultry Science. https://doi.org/10.3923/ijps.2003.242.250

Ahmad, S., Ahsan-ul-Haq, Yousaf, M., Kamran, Z., Ata-ur-Rehman, Suhail, M. U., & Samad, H. A. (2013). Effect of canola oil and vitamin A on egg characteristics and egg cholesterol in laying hens during hot summer months. Pakistan Veterinary Journal.

Akter, Y., Kasim, A., Omar, H., & Sazili, A. Q. (2014). Effect of storage time and temperature on the quality characteristics of chicken eggs. Journal of Food, Agriculture and Environment.

Akyurek, H., & Okur, A. A. (2009). Effect of storage time, temperature and hen age on egg quality in free-range layer hens. Journal of Animal and Veterinary Advances, 8(10), 1953–1958.

Barile, E., Bonanomi, G., Antignani, V., Zolfaghari, B., Sajjadi, S. E., Scala, F., & Lanzotti, V. (2007). Saponins from Allium minutiflorum with antifungal activity. Phytochemistry. https://doi.org/10.1016/j.phytochem.2006.10.009

Carranco-Jáuregui, M. E., Sanginés-García, L., Morales-Barrera, E., Carrillo-Domínguez, S., Ávila-González, E., Fuente-Martínez, B., … Romo, F. P. G. (2006). Shrimp head meal in laying hen rations and its effects on fresh and stored egg quality. Interciencia, 31(11), 822–827.

Cheng, G., Hao, H., Xie, S., Wang, X., Dai, M., Huang, L., & Yuan, Z. (2014). Antibiotic alternatives: The substitution of antibiotics in animal husbandry? Frontiers in Microbiology. https://doi.org/10.3389/fmicb.2014.00217

Christaki, E., Bonos, E., Giannenas, I., & Florou-Paneri, P. (2012). Evaluation of Oregano and $α$ -Tocopheryl Acetate on Laying Japanese Quail Diets. Journal of Basic & Applied Sciences, 8(January 2015), 238–242. https://doi.org/10.6000/1927-5129.2012.08.01.36

Contreras-Castillo, C., Brossi, C., Previero, T., & Demattê, L. (2008). Performance and carcass quality of broilers supplemented with antibiotics or probiotics. Revista Brasileira de Ciência Avícola, 10(4). https://doi.org/10.1590/S1516-635X2008000400006

Contreras-Castillo, C., Brossi, C., Previero, T., & Demattê, L. (2009). Performance and carcass quality of broilers supplemented with antibiotics or probiotics. Revista Brasileira de Ciência Avícola. https://doi.org/10.1590/s1516-635x2008000400006

Edens, F. (2007). An alternative for antibiotic se in poultry: probiotics. Revista Brasileira de Ciência Avícola. https://doi.org/10.1590/s1516-635x2003000200001

FAO. (2015). FAO Statistical Pocketbook World food and agriculture 2015. In Food and Agriculture

Organization of the United Nations. https://doi.org/978-92-5-108802-9

Fredotovíc, Ž., Šprung, M., Soldo, B., Ljubenkov, I., Budić-Leto, I., Bilušić, T., … Puizina, J. (2017). Chemical composition and biological activity of allium cepa L. and Allium × cornutum (Clementi ex Visiani 1842) methanolic extracts. Molecules. https://doi.org/10.3390/molecules22030448

Gadde, U., Kim, W. H., Oh, S. T., & Lillehoj, H. S. (2017). Alternatives to antibiotics for maximizing growth performance and feed efficiency in poultry: a review. Animal Health Research Reviews. https://doi.org/10.1017/s1466252316000207

Goliomytis, M., Kostaki, A., Avgoulas, G., Lantzouraki, D. Z., Siapi, E., Zoumpoulakis, P., … Deligeorgis, S. G. (2018). Dietary supplementation with orange pulp (Citrus sinensis) improves egg yolk oxidative stability in laying hens. Animal Feed Science and Technology, 244, 28–35. https://doi.org/10.1016/j.anifeedsci.2018.07.015

Goodarzi, M., Landy, N., & Nanekarani, S. (2013). Effect of onion (Allium cepa L .) as an antibiotic growth promoter substitution on performance , immune responses and serum biochemical parameters in broiler chicks. 5(8), 1210–1215.

Goodarzi, M., & Nanekarani, S. (2014a). Effect of Onion Extract in Drink Water on Performance and Carcass Traits in Broiler Chickens. IERI Procedia, 8(December), 107–112. https://doi.org/10.1016/j.ieri.2014.09.018

Goodarzi, M., & Nanekarani, S. (2014b). Effect of Onion Extract in Drink Water on Performance and Carcass Traits in Broiler Chickens. IERI Procedia, 8, 107–112. https://doi.org/10.1016/j.ieri.2014.09.018

Hester, P. Y. (2005). Impact of science and management on the welfare of egg laying strains of hens. Poultry Science. https://doi.org/10.1093/ps/84.5.687

Hong, J. C., Steiner, T., Aufy, A., & Lien, T. F. (2012). Effects of supplemental essential oil on growth performance, lipid metabolites and immunity, intestinal characteristics, microbiota and carcass traits in broilers. Livestock Science, 144(3), 253–262. https://doi.org/10.1016/j.livsci.2011.12.008

Jin, Y. H., Lee, K. T., Lee, W. I., & Han, Y. K. (2011). Effects of Storage Temperature and Time on the Quality of Eggs from Laying Hens at Peak Production. Asian-Australasian Journal of Animal Sciences, 24(2), 279–284. https://doi.org/10.5713/ajas.2011.10210

Kuete, V. (2017). Allium cepa. In Medicinal Spices and Vegetables from Africa: Therapeutic Potential Against Metabolic, Inflammatory, Infectious and Systemic Diseases. https://doi.org/10.1016/B978-0-12-809286-6.00014-5

Lampe, J. W. (1999). Health effects of vegetables and fruit: assessing mechanisms of action in human experimental studies. American Society for Clinical Nutrition, 70(suppl), 475S--490S. Retrieved from http://ajcn.nutrition.org/content/70/3/475s.short

Lancaster, J. E., Reynolds, P. H. S., Shaw, M. L., Dommisse, E. M., & Munro, J. (1989). Intra-cellular localization of the biosynthetic pathway to flavour precursors in onion. Phytochemistry. https://doi.org/10.1016/0031-9422(89)80032-9

Lee, K. W., Everts, H., Kappert, H. J., Frehner, M., Losa, R., & Beynen, A. C. (2003). Effects of dietary essential oil components on growth performance, digestive enzymes and lipid metabolism in female broiler chickens. British Poultry Science, 44(3), 450–457. https://doi.org/10.1080/0007166031000085508

Lopez-Bote, C. J., Sanz Arias, R., Rey, A. I., Castaño, A., Isabel, B., & Thos, J. (1998). Effect of free-range feeding on n−3 fatty acid and $α$-tocopherol content and oxidative stability of eggs. Animal Feed Science and Technology, 72(1–2), 33–40. https://doi.org/10.1016/S0377-8401(97)00180-6

Marcinčk, S., Popelka, P., Zdolec, N., Mártonová, M., Šimková, J., & Marcinčáková, D. (2011). Effect of suplementation of phytogenic feed additives on performance parameters and meat quality of broiler chickens. Slovenian Veterinary Research, 48(1), 27–34.

Martinez, MArta Corzo and Villamiel, M. (2012). An Overview on Bioactivity of Onion. J. Poult. Sci. 2011;75(2): 114–5

Mathew, P. T., & Augusti, K. T. (1975). Hypoglycaemic effects of onion, Allium cepa Linn. on diabetes mellitus: a preliminary report. Indian Journal of Physiology and Pharmacology.

Manterys A, Franczyk-Zarow M, Czyzynska-Cichon I, Drahun A, Kus E, … Kostogrys RB. Haematological parameters, serum lipid profile, liver function and fatty acid profile of broiler chickens fed on diets supplemented with pomegranate seed oil and linseed oil. Br. Poult. Sci. 2016;57(6): 771–9.

O'Hara, M. (1998). A Review of 12 Commonly Used Medicinal Herbs. Archives of Family Medicine, 7(6), 523–536. https://doi.org/10.1001/archfami.7.6.523

Onibi, G. E., Adebisi, O. E., Fajemisin, a N., & Adetunji, a V. (2009). Response of broiler chickens in terms of performance and meat quality to garlic (Allium sativum) supplementation. African Journal of Agricultural Research, 4(5), 511–517. Retrieved from http://www.academicjournals.org/ajar/PDF/pdf

Rahimi, S., Teymouri Zadeh, Z., Karimi Torshizi, M. A., Omidbaigi, R., & Rokni, H. (2011). Effect of the three herbal extracts on growth performance, immune system, blood factors and intestinal selected bacterial population in broiler chickens. Journal of Agricultural Science and Technology, 13(4), 527–539.

Rahman A, Eren GULTEPE E, Uyarlar C, Sadi CETINGUL Aamir IQBAL I, Bayram I. Effect of Mentha Piperita (Peppermint) Extract and its Juice on Egg Quality Traits during Different Storage Time in Laying Hens. Kocatepe Vet. J. Kocatepe Vet J Kocatepe Vet J. 2017;10(101): 14–20.

Saki AA, Rabet M, Zamani P, Yousefi A. The Effects of Different Levels of Pomegranate Seed Pulp with Multi-Enzyme on Performance, Egg Quality and Serum Antioxidant in Laying Hens. Iran. J. Appl. Anim. Sci. 2014c;4(4): 803–8.

Samli, H. E., Agma, A., & Senkoylu, N. (2005). Effects of Storage Time and Temperature on Egg Quality in Old Laying Hens. Poultry Science, 14(1), 548–553. https://doi.org/10.1093/japr/14.3.548

Scanes, C. G. (2007). Contribution of Poultry to Quality of Life and Economic Development in the Developing World. Poultry Science. https://doi.org/10.3382/ps.2007-86-11-2289

Thaxton, Y. V., Balzli, C. L., & Tankson, J. D. (2003). Relationship of broiler flock numbers to litter microflora. Journal of Applied Poultry Research.

Tona, K., Onagbesan, O., De Ketelaere, B., Decuypere, E., & Bruggeman, V. (2004). Effects of age of broiler breeders and egg storage on egg quality, hatchability, chick quality, chick weight, and chick posthatch growth

to forty-two days. Journal of Applied Poultry Research, 13(1), 10–18. https://doi.org/10.1093/japr/13.1.10

Van Boeckel, T. P., Brower, C., Gilbert, M., Grenfell, B. T., Levin, S. A., Robinson, T. P., … Laxminarayan, R. (2015). Global trends in antimicrobial use in food animals. Proceedings of the National Academy of Sciences of the United States of America. https://doi.org/10.1073/pnas.1503141112

WINDHORST, H.-W. (2011). Changes in poultry production and trade worldwide. World's Poultry Science Journal, 62(04), 585–602. https://doi.org/10.1079/wps2006114

Zhou, G., Wang, J., Zhu, X., Wu, Y., Gao, M., & Shen, H. (2014). Induction of maggot antimicrobial peptides and treatment effect in salmonella pullorum-Infected chickens. Journal of Applied Poultry Research. https://doi.org/10.3382/japr.2013-00804