

EFFECT OF DENSITY AND DIFFERENT LEVELS OF GREEN TEA ON PRODUCTIVE PERFORMANCE, AND SOME BLOOD BIOCHEMICAL PARAMETERS OF QUAIL

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ABSTRACT

This research was conducted at the farm of the Animal Production Department/ College of Agriculture and Forestry/University of Mosul. A total of 624 unsexed quail birds (1- 49 days) were randomly distributed in cages as follows: The 1st, 2nd, 3rd, and 4th groups were included 44 birds/m² and they were fed a standard diet supplemented with 0, 0.5, 1 and 1.5% green tea respectively. The 5th, 6th, 7th, and 8th groups were included 52 birds/m² and they were fed a standard diet supplemented with 0, 0.5, 1 and 1.5% green tea respectively. The 9th, 10th, 11th, and 12th groups were included 60 birds/m² and they were fed a standard diet supplemented with 0, 0.5, 1 and 1.5% green tea respectively. The results show a significant increase in live body weight, weight gain, improvement in feed conversion, production index and factor and albumen concentration within density 44 bird/m². The same results were occurred, in addition to the decrease in cholesterol and triglycerides concentration, when adding the 1.5% green tea, while the feed consumption, mortality%, glucose, protein, lipid profile parameters, GOT, and GPT were decreased significantly ($p \leq 0.05$) in the same density and in the same level of adding tea that mentioned before. In the interaction between density and adding green tea, green tea traits improved most of the characters within the same density as compared with treatments without adding green tea.

Keywords: quail, density, green tea, productive performance, blood biochemical parameters.

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INTRODUCTION

In the last several years poultry production had witnessed development in meat and egg production to face the increasing demand in the global market, so the poultry producer turned to intensive quail breeding (Abou El-Ela, 2005). It has become necessary to search for new techniques to increase production, especially the optimal use of space to reduce the cost per unit to maintain the level of production when crowding consider a stressful factor that reflects on the performance of the birds (Houshmand *et al.*, 2012). The state of health and immunity of birds is reduced in high density, which makes birds unable to get rid of heat. The use of a selective genetic improvement to raise the rate of body weight has a negative correlation to immunity response in broilers, which led breeders to use medical drugs during the breeding period to reduce the mortality and that has a negative impact reflected on the components of carcass and their effects in the health of human, that make as to

seek for medical plants that had same medical effects (Belewn *et al.*, 2009) and as growth promoters (Çabuk *et al.*, 2003) and antibacterial impact (Saeed and Taria, 2006) and enhance the function of liver, pancreas and small intestine, and improve the immunity (Giannenas *et al.*, 2003). Green tea used in this research, which is one of the medical plants whose experts believe that *Catchin* is an active substance, which proved to be an antioxidant and has protective properties against oxidation damage (Rice *et al.*, 2001), Flavonoids in green tea inhibit the oxidative processes of free radicals (Jiang *et al.*, 2003) that consider to be a carcinogen agent (Hong *et al.*, 2009). Dipti *et al.*, (2003) and Suad (2010) noted that the chemical matters in green tea boosted immunity against bacteria and viruses and improve the intestine environment. This called for research to find some management (nutritive) methods to reduce the effects of stress-induced density by using medicinal plants (Green Tea).

MATERIALS AND METHODS

This research included the effects of adding green tea powder at different concentrations to the quail rations in different density in production characters and blood biochemical parameters. The 1st, 2nd, 3rd, and 4th groups were included 44 birds/m² and they were fed a standard diet supplemented with 0, 0.5, 1 and 1.5% green tea respectively. The 5th, 6th, 7th, and 8th groups were included: 52 birds/m² and they were fed a standard diet supplemented with 0, 0.5, 1 and 1.5% green tea respectively. The 9th, 10th, 11th, and 12th groups were included 60 birds/m² and they were fed a standard diet supplemented with 0, 0.5, 1 and 1.5% green tea respectively. Chicks were reared in cages and fed on two diets formed according to the National Research Council Anonymous (1994), the starter diets: 22% protein and 2918 Kcal energy and grower diet: 24% protein and 3012 Kcal energy.

Chicks were weekly weighted, quantities of feed consumed, and weights gain were measured, the conversion factor was extracted, both the production factor and index were calculated. At the end of the experiment 49 days aged, 4 birds from each replicate (2 males + 2 females) were slaughtered and processed. The blood samples were collected in tubes without anticoagulants the serum isolated, then preserved at (-20°C) till the biochemical tests were carried out, according to Friedewald *et al.*, (1972) method, which included: estimation of glucose, cholesterol, triglyceride, and high and low density lipoprotein concentrations in serum according to the following equation :

$$\text{LDL-C} = \text{Total cholesterol} - \left[\frac{\text{Triglycerides}}{5} + \text{HDL-C} \right]$$

$$\text{VLDL-C} = \frac{\text{Triglycerides}}{5}$$

Estimation of total protein, albumin, and globulin concentration done according to Tietz (1995) method following equation:

Globulin concentration (g/100ml) = total protein concentration - albumin concentration.

Estimation of AST and ALT concentration in serum done by using BioSystem kits.

Statistical analysis: done by completely Randomized Design (CRD). Collected data were analyzed by Anonymous (2001), (specific groups differences were determined using Duncan's multiple range test (Steel and Torrie, 1960) at ($p \leq 0.05$) significant level. and according to the model.

$Y_{ij} = \mu + t_i + E_{ij}$ Since: - Y_{ij} = Value of observation, μ = Average of observation = Treatment Effect, E_{ij} = Experimental Error.

RESULTS AND DISCUSSION

Table (1) shows a significant differences between densities in final body weight. Static analyses of data revealed, the density of 44 bird /m² has higher body weight as compared with other densities, and the addition of green tea, significantly increased body weight in green tea treatments as compared with control. The interaction effects, 44 bird/m² density with adding 0.5% green tea showed the best final body weight, and the lowest interaction was 44 bird/m² density with 0% addition of green tea. In the same table we can notes that the treatment of 44 bird/m² had a superior weight gain compared with 60 bird/m² density, and there were no significant differences between the levels of added green tea, and the interaction 44 bird/m² with 0.5% added green tea shows the best weight gain and the lowest was for the treatment 44 bird/m² density with 0.0% added green tea, this was agreed with Feddes et al.,(2002) and Hassan (2009). From Table (1) it was clear that the 60 bird/m² treatment consume more total feed than 52 bird/m² significantly, this may be due to the high level of competition between birds, and didn't differ with 44 bird/m², there was no significant effect of added green tea on feed consumption as compared to those without adding green tea. The interaction between 60 bird/m² density with 0.5% added tea shows the best value of feed consumption while the lowest in 52 bird/m² density with 0.5 and 1.0% green tea, also from the Table (1) we note that the best feed conversion was in 44 bird/m² density and in 52 bird/m² density while it deteriorated through increasing the density to 60 bird/m², this agreed with Siegel and Honaker (2014). Most of the feed consumed associated with uncomfortable conditions, and the best feed conversion was in the addition of green tea 1, 1.5%. While the best interaction was in 44 bird/m² density with added 0.5,1, 1.5% green tea and 52 bird/m² density with 1.5% green tea. It was noted that the addition of green tea had improved the conversion factor within the same density as compared to the control. This may be due to improved utilization of nutrients through improved absorption as green tea slows the passage of nutrient content due to increased feed bulk what gives more time for the action of enzymes as well as the development and growth of villi and crypts, increasing the absorption efficiency of digested substances (Latshaw, 2008 ; Crespo and Garcia, 2002).

Table (2) shows a significant increase in the mortality percent in the treatment 60 bird/m² density in a7th week, this results from the burden of heat stress within the herd whereas it is difficult for birds to get rid of excess heat and the emergence of cases of lack in ventilation despite the provision of good and equal ventilation, and an incensement in the level of hostility between birds and sudden death as a result of disequilibrium of internal balance processes (Metheringham and Hubrecht, 1996). In regard to green tea, the mortality% decreased significantly in the when the green tea added with 1.5% compared to the addition of 0% green tea, because the green tea contains antioxidants that have a pharmacological effects (Suad, 2010), particularly anti-inflammatory effect that acts in the intestines and liver (Dipti *et al.*, 2003), also influencing immunity , especially in stress conditions (Sahin *et al.*, 2010 ; El-Deek *et al.*, 2011). There were a significant increase in the mortality% in the interaction 60

bird/m² density with 0% green tea while the mortality was reduced significantly in the treatment 44 bird/m² with added 0.5,1.0,1.5% green tea, green tea addition may be decreased the stress of congestion by improving the immunity and the health of the birds. In regard to the effect of density in the production index , the densities 44 bird/m² and 52 bird /m² were better than the treatment 60 bird/m² in the 7th week and these results were agreed with Agrawal *et al.*, (2003) and Hassan (2009), and there was no significant difference between the treatments of added green tea in production index for birds .The best production index was 44 bird/m² with 0.5% green tea and the best production factor was in interaction 44 bird/m² with 0.5% green tea.

Tables (3) and (4) showed that there were no significant differences between the densities in the cholesterol mg/dl , triglycerides mg/dl, LDL mg/dl , VLDL mg/dl, albumin g/l, GPT and GOT IU/L, concentration due to high density, the results agreed with Abdel-Azeem (2010) and Houshmand *et al.*, (2012). For the effect of green tea supplementation, cholesterol, TG, LDL, HDL, VLDL, GOT and GPT values were observed to be lower when Green tea was added with 1.5%. Thus, the addition of green tea can be considered as a managing technique to treat the stress of the density through nutrition. As for the interaction, we note that the highest increase in cholesterol, LDL, albumin, and GPT occurred was at 52 bird/m² with 0% green tea. Stress as a result of crowding forces the bird to live in an insufficient area for movement which affects the behavior of the birds (Al-Hamed, 2010 ; Sahin *et al.*, 2016). This leads to increased mortality due to diseases associated with low immunity and low natural body resistance (Al-Sheikhli, 2003 ; Tabler et al., 2004 ; Al-Naimi, 2018). Also, the emergence of hostility and increased incidence of cannibalism calculated among excluded individuals, but the addition of green tea, especially the concentration 1.0 and 1.5% had reduced this effect and enhanced the immunity of birds and raise the health level of birds which reflected in the performance of birds in general.

Table (1): Effect of density and different levels of green tea and their interaction on body weight of quail.

Weeks		Initial body weight (2 week)	Final body weight (7 th)	Weight gain	Feed consumption	Feed conversion
Effect of Density (bird/m ²):						
44		24.16	225.29 a ± 1.99	201.13 a ± 2.29	628.34 ab ± 7.90	3.12 b ± 0.05
52		21.21	216.84 b ± 3.75	195.63 ab ± 3.54	618.27 b ± 9.59	3.14 b ± 0.05
60		22.04	212.91 b ± 3.84	190.87 b ± 2.47	649.72 a ± 6.77	3.40 a ± 0.06
Effect of Tea (%):						
	0.0	23.92	218.49 b ± 1.79	194.57 a ± 2.47	623.58 a ± 9.19	3.25 a ± 0.09
	0.5	25.44	224.29 a ± 2.44	198.85 a ± 4.22	637.20 a ± 14.69	3.20 a ± 0.09
	1.0	25.44	223.29 a ± 3.78	197.88 a ± 2.42	628.19 a ± 8.05	3.17 b ± 0.07
	1.5	25.82	228.35 a ± 3.51	200.53 a ± 4.94	639.46 a ± 25.69	3.18 b ± 0.18
Effect of Interaction Between Density (bird/m ²) and Tea (%):						
44 (bird/m ²)	0.0 %	23.46	204.24 c ± 2.44	180.78 d ± 4.94	614.79 b ± 25.69	3.40 a ± 0.18
	0.5 %	23.27	235.60 a ± 3.78	212.33 a ± 4.30	624.07 b ± 6.63	2.93 d ± 0.08
	1.0%	21.61	225.89 b ± 3.59	204.20 ab ± 2.63	633.14 b ± 12.84	3.01 d ± 0.03
	1.5%	25.30	232.54 a ± 5.50	207.24 b ± 2.59	641.36 ab ± 15.74	3.09 d ± 0.03
52 (bird/m ²)	0.0 %	24.77	209.11 c ± 5.16	184.34 d ± 3.84	617.85 b ± 6.60	3.35 a ± 0.07
	0.5 %	25.95	216.6 bc ± 10.54	190.63 c ± 3.43	603.16 b ± 33.45	3.16 c ± 0.04
	1.0%	23.24	216.2 bc ± 5.25	193.0 c ± 3.91	603.99 b ± 10.04	3.13 c ± 0.08
	1.5%	22.22	232.45 a ± 4.05	210.23 a ± 8.21	648.06 ab ± 11.61	3.08 d ± 0.04
60 (bird/m ²)	0.0 %	22.51	207.12 c ± 2.31	184.61 d ± 4.29	638.09 ab ± 10.89	3.46 a ± 0.09
	0.5 %	23.10	210.7 bc ± 5.01	187.60 d ± 8.54	684.37 a ± 5.81	3.45 a ± 0.07
	1.0%	21.65	213.8 bc ± 1.46	192.15 c ± 2.49	627.45 b ± 10.58	3.26 b ± 0.06
	1.5%	23.58	215.7 bc ± 3.81	192.12 c ± 1.77	628.98 b ± 7.90	3.27 b ± 0.02

- The above values represent mean ± standard error.

- Values that have different letters vertically indicate a significant difference at (p≤0.05).

Table (2): Effect of density and different levels of green tea and their interaction on mortality%, index production, and coefficient production at 7th week aged quail.

Weeks Treatments	Mortality%	production index	production coefficient	
Effect of Density (bird/m ²):				
44	4.17±1.20 b	14.12±0.50 a	6.18±1.39 a	
52	7.50±1.34 b	13.04 ±0.42 a	5.76±0.62 b	
60	12.08±1.25 a	10.09 ±0.34 b	4.94±0.55 b	
Effect of green Tea (%):				
0.0	10.56±1.19 a	12.27 ±0.80 a	5.35±0.85 a	
0.5	8.33±1.19 ab	13.11 ±1.39 a	5.67±1.28 a	
1.0	7.22 ±1.93 ab	13.34 ±0.22 a	5.79±1.01 a	
1.5	5.56±1.09 b	13.84 ±0.87 a	5.96±0.75 a	
Effect of Interaction Between Density (bird/m ²) and Green Tea (%):				
44 (bird/m ²)	0.0 %	5.00 ±1.20 c	11.65 ±1.22 b	5.51 ± 0.91 b
	0.5 %	3.34±1.03 d	15.86 ±0.22 a	7.00 ±0.61 a
	1.0 %	3.34 ±1.83 d	14.80 ±0.44 a	4.73±0.51 c
	1.5 %	3.34±1.91 d	14.85 ±0.90 a	6.48 ±1.32 ab
52 (bird/m ²)	0.0 %	10.00±3.19 b	11.47±1.70 b	4.95 ±0.58 c
	0.5 %	8.33±2.72 bc	12.82±0.56 ab	5.53 ±0.37 b
	1.0 %	6.67±3.09 c	13.16 ±0.99 a	5.75 ±0.85 b
	1.5 %	5.00±1.81 c	14.63 ±0.43 a	6.48 ±0.90 ab
60 (bird/m ²)	0.0 %	16.67±1.67 a	10.18 ±0.34 b	4.45 ±0.24 c
	0.5 %	11.67 ±1.55 b	11.01 ±0.39 b	4.80±0.86 c
	1.0 %	11.67 ±3.19 b	11.82 ±0.31 b	5.21 ±1.17 b
	1.5 %	8.33 ±1.60 bc	12.34 ±0.40 b	5.39 ±1.24 b

- The above values represent mean ± standard error .
- Values that have different letters vertically indicate a significant difference at (p≤0.05).

Table (3):Effect of density and different levels of green tea and their interaction on lipid profile parameters of quail at 49 days age.

Parameters		Cholesterol mg/dl	triglycerides mg/dl	LDL mg/dl	HDL mg/dl	VLDL mg/dl
Effect of Density(bird/m ²):						
44		5.27 a ±0.21	5.90 a ±0.26	3.13 b ±0.8	1.23 a ±0.05	1.19 a ±0.04
52		4.96 a ±0.37	6.28 a ±0.44	3.97 a ±0.21	1.17 a ±0.04	1.25 a ±0.06
60		5.78 a ±0.34	6.15 a ±0.50	3.72 ab ±0.32	1.32 a ±0.10	1.20 a ±0.08
Effect of Tea (%):						
0.0		5.91 a ±0.35	7.04 a ±0.46	4.12 a ±0.37	1.00 c ±0.12	1.37 a ±0.05
0.5		5.97 a ±8.30	6.07 a ±0.55	3.70 a ±0.55	1.33 b ±0.09	1.22 a ±0.07
1.0		4.88 ab ±0.64	6.60 a ±0.88	3.91 a ±0.06	1.45 a ±0.06	1.32 a ±0.3
1.5		4.59 b ±0.61	4.73 b ±1.24	2.69 b ±0.32	1.17 bc ±0.05	0.95 b ±0.10
Effect of Interaction Between Density (bird/m ²)and Tea (%):						
44 (bird/m ²)	0.0 %	6.60 ab ±0.79	5.70 a ±0.63	3.50 ab ±0.61	1.20 bc ±0.03	1.16 b ±0.05
	0.5 %	5.50 ab ±0.61	7.10 a ±1.24	2.98 bc ±0.32	1.10 bc ±0.05	1.42 a ±0.10
	1.0 %	4.67 ab ±0.30	5.90 a ±0.55	3.32 b ±0.55	1.40 b ±0.09	1.18 b ±0.07
	1.5 %	4.30 b ±0.64	4.90 a ±0.88	2.72 bc ±0.06	1.20 bc ±0.06	0.98 c ±0.13
52 (bird/m ²)	0.0 %	5.50 ab ±0.62	6.40 a ±1.17	4.02 ab ±0.82	1.10 bc ±0.05	1.27 ab ±0.19
	0.5 %	5.42 ab ±1.07	6.80 a ±1.10	4.54 ab ±0.33	0.90 c ±0.07	1.36 a ±0.09
	1.0 %	4.50 b ±0.68	7.30 a ±0.82	4.54 ab ±0.60	1.56 ab ±0.27	1.46 a ±0.10
	0.5 %	4.40 b ±0.29	4.60 a ±0.44	2.78 bc ±0.11	1.10 bc ±0.08	0.92 c ±0.04
60 (bird/m ²)	0.0 %	6.80 a ±0.88	7.21 a ±0.53	4.84 a ±0.83	1.00 c ±0.14	1.33 a ±0.08
	0.5 %	5.07 ab ±0.87	4.70 a ±1.22	2.56 c ±0.34	1.2 bc ±0.32	0.95 c ±0.02
	1.5 %	5.80 ab ±0.52	6.10 a ±0.52	3.58 ab ±0.48	1.69 a ±0.40	1.22 ab ±0.17
	1.0 %	5.47 ab ±0.34	6.60 a ±0.93	3.88 ab ±0.78	1.40 b ±0.04	1.32 a ±0.02

- The above values represent mean ± standard error.

- Values that have different letters vertically indicate a significant difference at (p≤0.05).

Table (4): Effect of density and different levels of green tea and their interaction on some blood biochemical parameters of quail at 49 days age.

Parameters Treatments	Glucose (mg /dl)	Protein g/l	Albumen g/l	GPT IU/L	GOT IU/L	
Effect of Density(bird/m ²):						
44	223.67 c ±3.74	3.89 b ±0.21	2.33 a ±0.07	17.38 a ±0.66	13.50 a ±0.62	
52	229.33 b ±9.07	4.45 ab ±0.38	2.50 a ±0.11	16.59 a ±1.17	14.00 a ±1.35	
60	235.82 a ±5.00	5.00 a ±0.27	2.44 a ±0.14	17.00 a ±1.34	14.80 a ±1.16	
Effect of Tea (%):						
0.0	235.65 b ±4.43	4.10 a ±0.38	2.15 b ±0.12	19.72 a ±1.00	17.33 a ±6.64	
0.5	169.89 c ±3.33	4.10 a ±0.48	2.30 b ±0.08	18.00 ab ±2.15	15.33 a ±1.99	
1.0	246.89 a ±2.28	5.08 a ±0.40	2.50 ab ±0.11	16.45 bc ±1.39	13.01 b ±2.14	
1.5	239.00 b ±2.28	4.55 a ±0.16	2.73 a ±0.50	13.77 c ±2.41	10.72 c ±1.37	
Effect of Interaction Between Density (bird/m ²)and Tea (%):						
44 (bird/m ²)	0.0 %	224.00 d ±3.23	4.01 ab ±0.48	2.20 bc ±0.08	18.17 ab ±0.08	16.0 ab ±1.99
	0.5 %	175.00 g ±2.28	4.00 ab ±0.40	2.30 b ±0.11	21.00 a ±0.11	18.00 a ± 2.14
	1.0 %	250.67 a ±2.28	4.35 ab ±1.16	2.20 bc ±0.06	16.00 b ±0.06	18.00 a ±1.35
	1.5 %	245.00 ab ±3.56	3.20 b ±1.05	2.60 a ±0.45	14.00 c ±0.45	8.00 d ±0.47
52 (bird/m ²)	0.0 %	233.00 c ±1.51	4.20 ab ±0.21	2.00 c ±0.36	21.00 a ±0.36	19.00 a ±0.92
	0.5 %	202.00 f ±3.18	4.10 ab ±0.35	2.50 a ±0.11	19.00 a ±0.11	15.0 b ±0.81
	1.0 %	243.33 ab ±1.35	5.30 ab ±0.92	2.80 a ±0.16	16.35 b ±0.16	13.00 c ±1.04
	1.5 %	239.00 b ±3.17	4.21 ab ±0.30	2.70 a ±0.33	9.99 d ±0.33	9.00 d ±0.94
60 (bird/m ²)	0.0 %	249.96 a ±2.99	4.10 ab ±0.28	2.26 b ±0.14	20.00 a ±0.14	17.0 a ±1.00
	0.5 %	213.67 e ±1.26	4.20 ab ±0.38	2.10 c ±0.02	14.01 c ±0.02	13.00 c ±1.21
	1.0 %	246.07 ab ±2.68	5.60 a ±0.61	2.50 a ±0.36	17.00 ab ±0.36	14.04 b ±1.11
	1.5 %	233.00 c ±2.78	6.23 a ±0.94	2.90 a ±0.05	17.00 ab ±0.05	15.15 b ±1.00

- The above values represent mean ± standard error.

- Values that have different letters vertically indicate a significant difference at (p≤0.05).

تأثير الكثافة ومستويات مختلفة من الشاي الأخضر في الأداء الإنتاجي وبعض المعايير الكيموحيوية لدم طائر السمان

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الخلاصة

أجري البحث في الحقل التابع لقسم الإنتاج الحيواني في كلية الزراعة والغابات/ جامعة الموصل، وزع عشوائياً 624 طائراً من طيور السمان غير الجنس، إذ ربيت الطيور في أقفاص من عمر يوم واحد ولغاية 49 يوماً، وكانت مجموعات الدراسة كالاتي: المجموعة الأولى والثانية والرابعة ذات كثافة طيور 44 طائر/م² وغذيت هذه المجموع على عليقة قياسية مضافاً إليها 0، 0.5، 1، 1.5% من الشاي الأخضر على التوالي، والمجموع الخامسة والسادسة والسابعة والثامنة ذات كثافة طيور 52 طائر/م² وغذيت هذه المجموع على عليقة قياسية مضافاً إليها 0، 0.5، 1، 1.5% من الشاي الأخضر على التوالي، والمجموع التاسعة والعاشر والحادية عشرة والثانية عشرة ذات كثافة طيور 60 طائر/م² وغذيت هذه المجموع على عليقة قياسية مضافاً إليها 0، 0.5، 1، 1.5% من الشاي الأخضر على التوالي. نتائج التحليل الإحصائي بينت وجود زيادة معنوية في وزن الجسم الحي، الزيادة الوزنية، وتحسن في معامل التحويل الغذائي، ومعامل ودليل الإنتاج وتركيز الألبومين في الكثافة 44 طائر/م². تحققت نفس النتائج بالإضافة إلى انخفاض الكولسترول والدهون الثلاثية عند إضافة المستوى 1.5% من الشاي الأخضر، بينما انخفضت معنوياً كمية العلف المستهلك والهلاكات، وتركيز كل من الكلوكوز والبروتين والمعايير الدهنية للدم والـ GOT و GPT في نفس الكثافة وبمستوى إضافة السابقة الذكر. وفي التداخل بين الكثافة والشاي الأخضر، حسنت معاملات الشاي الأخضر معظم الصفات المذكورة داخل تأثير نفس الكثافة مقارنة مع تلك المعاملات التي كانت بدون إضافة.

الكلمات الدالة: السمان، الكثافة، الشاي الأخضر، الأداء الإنتاجي، المعايير الكيموحيوية للدم.

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