

Impact Of Utilization Sage Powder Leaves (*Salvia officinalis* L) On Productive Traits, Carcass Characteristics And Blood Parameters On New Zealand White Male Rabbits Diets

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ABSTRACT

This research aimed to enforce the effect of sage powder leaves on growth performance, carcass traits and blood parameters on New Zealand White (NZW) male rabbits. A total of 45 male rabbits at five weeks old, with initial body weights rang from (703.72g \pm 0.72g) used from 5 to 13 weeks of age was randomly divided into three groups (15 rabbits in each group) with 3 replicates (5 rabbits in each). The first group was fed basal diet as a control group without any supplementations, The second and third groups, which were fed the basal diet with 0.25% and 0.5% Sage powder (SP) /kg diet, respectively during the whole experiment period from 5 to 13 weeks of age.

The obtained results showed that the means of body weight at 9 and 13 weeks of age as well as total and daily

body weight gain were significantly heavier ($P \leq 0.05$) during the period from (5-9 weeks of age) in the group, which was provided with 0.5 % sage powder than the second and control groups. The pre-slaughter weight, liver and kidneys percentages significantly increased ($P \leq 0.05$). Also, Total protein, Albumin, Glucose and T3 significantly increased in the group supplemented with 0.5% sage powder / kg diet as compared with the second and control groups.

Conclusively, It can be summarized that the additive of Sage powder with 0.5% / kg diet is the best level for improve body weight and other growth performance of New Zealand White male rabbits.

Key words:- Sage powder leaves, blood parameters, NZW, male, rabbits

INTRODUCTION

The breeding rabbits to get the meat can be a correct way to solve the problem of deficiency of meat in the world, and this production of meat become the third-largest business after beef and chicken meats, this can be attributed to meat rabbit components such as high protein, depressed fat and calories (Trocino *et al.*, 2019). Recently, the modern consumer interests of is to eat feed more healthy and this can be found in rabbit meat which had more advantage which is suitable for babies, gravid women and common which injured with blood squeeze, this may be due to the major, minor and trace elements especially iron concentration which present in the rabbit meat. Also, It contain vitamins, such as group vitamin B compound and six fatty acids according to (Todorova and Ignatova (2024).

Use of normal plants such as extracts herbs and oils are more effective for good properties for meat of rabbits (Grigorova *et al.*, 2017). The *Salvia Officinalis L* is one of the substantial medicinal flora, this can be attributed to anti-infection properties because it contains Thujone compound and the importance of this compound has appeared in the medical handling of respiratory system infection (Zhang *et al.*, 2005). These plant additives prevent several illnesses and give validity this due to the sage extract advantage such as antioxidant and antimicrobial effect (Szabóová *et al.*, 2008).

The extract of sage plant leaves improved productive performance traits as well as blood constituents in rabbits (El-Bolkiny *et al.*, 2022). The additive of powder of sage leaves in diet can help to know all zoo- technical indicators in rabbits according to Rotolo *et al.*, (2013).

Al-Sherify and Al-Alwany (2016) reported that the hematological, biochemical as well as immunological parameters were improved in broilers which supplemented with sage powder.

Therefore, the main objective of this study is to investigate the effect of the supplementation of sage powder (SP) in the diet on the productive performance, blood parameters and slaughter traits of New Zealand White males rabbits.

MATERIALS AND METHODS

This experiment was implemented at a special farm, located in Manflout Town, Assiut Government, Egypt, during the period from (October to December 2024). This experiment was carried out in accordance with the ethical

guidelines of the research ethics committee of Faculty of Agriculture, Assuit University according to reference no (03-2025-0018).

Experimental design and rabbits treatments

A total of 45 (NZW) male rabbits at five weeks old, with average initial body weight of $(703.72\text{g} \pm 0.72\text{g})$ used from (5-13weeks of age) was randomly divided into three groups contain (15 rabbits in each group) with 3 replicates (5rabbits in each). The first group served as a control group without any supplementations, The second and third groups, which were fed diet with 0.25% and 0.5% Sage powder (SP)/ kg diet, respectively during the experiment period from (5 to 13 weeks) of age. Rabbits were placed in galvanized wire cages with sizes (50 Length \times 50 Width \times 40Height, cm) under the same administrative conditions and exposed daily to (13Light : 11 Dark). Diet in Pelleted form and water were offered *ad libitum* throughout the experimental . Diets were formulated as shown in Table (1) according to NRC (1977). The rabbits were kept in a controlled environment with temperatures ranging from (20 to 28°C) and humidity between (60 and 65%) and hygienic conditions.

Salvia powder preparation

Salvia officinalis L leaves were purchased from local company (Al Rahama Company) in Egypt and prepared to make powder throughout drainage in a dark room with suitable ventilation under humidity 40% and temperature of 28 °C for five days, and then were grinding through a 1mm screen this method and analysis for this powder, The analysis of sage powder was presented in Table (2) according to Farhadi *et al.*(2020).

Measurements and Observations

Productive traits

Live Body weight

The rabbits were weighed at three ages (5, 9 and 13 weeks of age) with digital balance at ± 0.1 g precision.

Body weight gain

Daily and total body weight gain was calculated according to this following equation:

$$\text{Daily body weight gain} = (\text{Bw}_2 - \text{Bw}_1) / \text{periods in days.}$$

Where: Bw_1 is the weight at the beginning of the period. Bw_2 is the weight of the same period.

Table (1): Ingredients and chemical composition of the basal diets fed to New Zealand White male rabbits (5-13 weeks of age).

Ingredients	(%)	Determined analysis**	%
Berseem hay	40.0	Dry matter (DM)	89.67
Yellow corn	10.0	Crude protein (CP)	17.18
Barley	13.0	Crude fiber (CF)	13.05
Wheat bran	15.0	Ether extract (EE)	3.41
Soybean meal	17.5	Nitrogen free extract (NFE)	56.03
Molasses	3.0	Ash	10.33
Di-calcium phosphate	0.8	Calculated analysis***	
Sodium chloride	0.3	Digestible energy (DE) ³ Kcal/Kg***	2519
Vit+ Min Premix 1	0.3	Calcium, %	0.83
DL-Methionine	0.1	Available phosphorus, %	0.31
Total	100	Methionine, %	0.36
		Total sulphur amino acid, %	0.68
		Lysine, %	0.98

Vit.+Min. mixture provides per kilogram contains: Vit A 6000 IU; Vit D3 450IU; Vit E 40 mg; Vit K3 1 mg; Vit B1 1 mg; Vit B2 3 mg; Vit B3 180 mg; Vit B6 39 mg; Vit B12 2.5 mg; Pantothenic acid 10 mg; biotin 10 mg; folic acid 2.5 mg; cho-line chloride 1200 mg; Manganese 15 mg; Zinc 35 mg; Iron 38 mg; Copper 5 mg; Selenium 0.1 mg; Iodine 0.2 mg; Selenium 0.05 mg.

**Analyzed values according to AOAC (1995)

***Calculated values according to NRC (1977).

****DE calculated according to Cheeke(1987).as follows:

$$DE=4.36-0.0491 *NDF\%, NDF\%=28.92+0.657*CF\%.$$

Table (2): Composition of sage powder (*Salvia officinals* L) according to Farhadi *et al.*(2020).

Items	Ingredients (%)
Crude protein	1.50
Ash	29.34
Crude fiber	6.66
Crude fat	1.04
Phenol	0.239

Feed consumption and Feed conversation ratio

Daily and total feed consumption were calculated every week and from this date the daily feed conversation ratio were calculated.

Carcass Traits

At end of experiment (13 weeks of age), 18 male rabbits for all groups were chosen without prejudice for slaughter. Rabbits were faster for 12 hours before slaughtering, and then there weighed individually as pre slaughter weight, rabbits were slaughter by cutting jugular vein. After completing bleeding, rabbits were weighed, skinned and eviscerated, carcass, liver, kidneys, heart and spleen were weight and determined as a percentage of pre-slaughter live body weight.

Blood samples

At 13 weeks of age (end of experiment), 18 blood samples(3 groups \times 3 replicates \times 2 rabbits) collected into heparinized and non-heparinized tubes for hematological study and biochemical determinations ,then centrifuged at (3×10^3 Rpm / 15 min).

Hematological parameters

The heparinized tubes which contain plasma were used to determine the hematological parameters as follow as:-

1. Red blood cells (RBCs) was determined by using the hemocytometer by putting 0.5 micron of blood in each test tube plus 1.5 ml salt solution. Then examined by putting 0.5 micron of the mixed solution and transferring into the hemocytometer slide to account the 5 squares of the slid and calculate the red blood cells according the method of West and Haines (2002).
2. Blood smears used to determine WBCs with the wedge method to produce blood film by placing a drop of blood, while Leishemen stain which contain proportions of methylene blue and eosion was used to pigmenting the slid after stabilizing this slide at 45° to the (horizontal) 1th slide and then stained to account eosinophil, heterophil, basophile, lymphocyte and monocyte according to Lynch *et al.*(1969).
3. The hemoglobin concentration (g/100 mL) was determined according to Drew *et al.*(2004).

Blood biochemical parameters

The serum, which produced from non-heparinized tubes was used to determine the blood biochemical components. Determination of total protein and albumin values content according Gomal *et al.* (1949) and Doumas *et al.*, (1971), respectively with reagent kits purchased from biodiagonstic chemical

company, Egypt. Globulin values were determined through this equations follow (Total protein - Albumin values). T3 and T4 levels were determined by Radioimmunoassay (RIA) kits (Tianjin Jiuding Company, China) and expressed in mg/dL.

Statistical analysis

The data were subjected to a one-way analysis of variance according to Snedecor and Cochran (1982) with the beak trimming effect, employing the Generalized Linear Model (GLM) procedure outlined in the SAS User's Guide (SAS, 2004). To exclude the effect of pre-slaughter weight on carcass parameters, an analysis of covariance (ANCOVA) was applied to the data of hot carcass and organ weights. Covariance analysis was conducted for carcass traits data to account for variations in pre-slaughter weight among the study groups.

Significant differences between treatments were determined by using Duncan's new multiple ranges test (Duncan, 1955).

RESULTS AND DISCUSSION

Body weight and body weight gain

Date presented in Tables (3 and 4) showed the Effect of sage powder on body weight, total and daily body weight gain on New Zealand White male rabbits from 5 to 13 weeks of age. The findings demonstrated that the body weight at 9 and 13 weeks of age as well as total and daily body weight gain were significantly ($P < 0.05$) heavier through duration from (5-9 wks. of age) in the treatment which supplemented with 0.5% sage powder (SP) as compared with the supplemented with 0.25% and control groups, This increase due to the antimicrobial effect of sage powder plant which improve the digestion on the digestive system of rabbit. Also, the Sp additive to diet had a good impact in rabbits through raising the feed exhaustion and weight gain according to Zabóová *et al.* (2008).

This is harmony with Khalifa *et al.*, (2024) showed that the NZW male rabbits supplemented with 0.5mg extract sage plant/ kg diet significantly increased body weight and body weight gain as compared with the control group. However, the rabbits which supplemented with 200mg sage extract /kg diet were significantly heavier BW and DBWG as compared with control group as reported with (El-Bolkiny *et al.*, 2022).

Table (3).Effect of sage powder on body weight on New Zealand White male rabbits from 5 to 13 weeks of age.

Age ↓ Weeks	Experimental groups			SEM	P-value
	Control	Sage powder (0.25%)	Sage powder (0.5%)		
IBW(g), 5Wks	704.83	703.00	703.34	0.89	0.393
Body weight at 9Wks	1060.11 ^b	1121.22 ^b	1223.11 ^a	16.93	0.006
Body weight at 13Wks	1732.56 ^c	1835.56 ^b	1945.56 ^a	7.70	0.001

^{A, b and c} Means with different superscripts in the same row are significantly different ($P \leq 0.05$),

SEM= standard error of the mean, IBW: Initial body weight.

Feed consumption and feed conversation ratio

Table (5) displayed the Effect of sage powder on total , daily feed consumption and feed conversion ratio on New Zealand White male rabbits from 5 to 13weeks of age. There were no significant differences between all treatments in in TFC, DFC and FCR, but the daily and total feed consumption improve in treated group supplemented with 0.5% sage powder /kg diet but whit out significant effect as compared with the 2th and 1th groups. This can be due to the sage plant advantages in improvement growth performance through feed utilization and increase the metabolic system by increasing enzymatic digestion, and liver function (Farhadi *et al.*, 2020). These results agreement with El-Bolkiny *et al.*(2022) who showed no significant difference between the rabbits which supplemented with 200mg Salvia Officinal /kg diet and other groups. But, feed consumption for NZW male rabbits supplemented with 0.5mg extract of sage plant / kg diet significantly raised as compared with the other group (Khalifa *et al.*, 2024).

The feed consumption in both groups of laying hens which supplemented with 0.1% and 0.2% *Salvia Officinals* extract / kg diet were higher as compared to the control group according to Al Hadi and Al Fadel (2024).

In this study, the feed conversion ratios during the periods(5-9) and (9-13) improved in the group which was supplemented with 0.5% sage powder as compared with second group and control group without significant effect. These results can be explained with the antimicrobial effect of salvia, which improve the digestion rate and improve the feed conversion ratio (Khalifa *et al.*, 2024).

Table (4). Effect of sage powder on total and daily body weight gain on White male rabbits from 5 to 13 weeks of age.

Traits	Ages (Weeks)	Experimental groups			SEM	P-Value
		Control	Sage powder (0.25%)	Sage powder (0.5%)		
Daily weight gain (g)	5-9	12.75 ^c	14.93 ^b	18.56 ^a	0.60	0.005
	9-13	24.02	25.15	25.80	0.70	0.272
Total weight gain(g)	5-9	349.11 ^c	418.22 ^b	519.78 ^a	16.83	0.005
	9-13	672.44	714.33	722.44	19.78	0.271

A, b and c

Means with different superscripts in the same row are significantly different ($P \leq 0.05$),

SEM= Standard error of the mean.

Table (5). Effect of sage powder on total, daily feed consumption and feed conversion ratio on New Zealand White male rabbits from 5 to 13 weeks of age.

Traits	Ages (Weeks)	Experimental groups			SEM	P-Value
		Control	Sage powder (0.25%)	Sage powder (0.5%)		
Daily feed consumption (g)	5-9	47.22	55.55	55.95	3.25	0.839
	9-13	97.14	95.63	97.22	2.08	0.217
Total feed consumption (g)	5-9	1322.22	1555.56	1566.67	91.17	0.217
	9-13	2720.22	2677.78	2722.22	58.45	0.839
Feed conversion ratio (g feed/ g gain)	5-9	3.81	3.75	3.02	0.20	0.0907
	9-13	4.06	3.76	3.77	0.15	0.367

These results are disagreed with Al Hadi and Al Fadel (2024) showed that the FCR improved significantly ($P < 0.05$) with addition (0.1 and 0.2%) of Sage plant extract in laying hens diets as compared to the other group. However, the better feed conversion ration found in the group which supplemented with 0.5mg sage plant extract / kg diet as compared with control group Khalifa *et al.* (2024) . Laying hens supplemented sage plant had a good feed conversion ration with Mustafa and Ihsan (2022).

Caracas traits

Effect of sage powder on carcass traits on NZW male rabbits at 13 weeks of age was presented in Table (6). The live body weight, liver and kidneys percentages increased significantly ($P < 0.05$) in the third group, which

Table(6). Effect of sage powder on carcass traits on New Zealand White male rabbits at 13 weeks of age.

Traits	Experimental groups			SEM	P-value
	Control	Sage powder (0.25%)	Sage powder (0.5%)		
Pre-slaughter BW (g)	1770.00 ^b	1888.66 ^{ab}	1907.33 ^a	18.17	0.011
Heart (%)	0.35	0.38	0.40	0.03	0.54
Liver (%)	3.58 ^b	4.51 ^a	4.55 ^a	0.12	0.012
Kidneys (%)	0.58 ^b	0.55 ^{ab}	0.71 ^a	0.02	0.027
Spleen (%)	0.09	0.10	0.12	0.01	0.172
Dressing(%)	62.14 ^b	65.37 ^a	65.47 ^a	0.69	0.049

^{A and b} Means followed by different lowercase letters in the same row are significantly different ($P \leq 0.05$). SEM= standard error of the mean, BW; Body weight.

supplemented with 0.5% sage powder/ kg diet as compared with second group (0.25% sage powder/ kg diet) and control group. This increment in body weight and other organs percentages such as (liver and kidneys) may be attributed to development quickly of body weight.

These findings are compatible with El-bolkiny *et al.*(2022) found that the body weight and liver weights in the rabbits which supplemented with 200mg *Salvia officinal* plant/kg diet significantly increased , but no significant differences in kidney weight as compared to other groups, as well as, Khalifa *et al.*(2024) demonstrated that liver weight of NZW rabbits supplemented with 0.5mg extract of sage/ kg diet increased significantly as compared with control group.

The other organs such as heart, spleen and dressing (%) didn't significant effect with sage powder supplementation. These results are agreed with those of Todorova and Ignatova (2024) found that the rabbits supplemented with 1.5% sage extract didn't significantly effect on carcass traits. Also , Pogány Simonová *et al.*(2022) reported that slaughter parameters didn't significantly affect with sage supplementation.

Hematological parameters

The Effect of sage powder on hematological parameters with in normal range on NZW male rabbits was showed in Table (7). These findings showed no significant differences on blood hematology parameters between treatment groups and control group expect hemoglobin concentration significantly increase in the group supplemented with 0.5% sage powder as compared with first group, this

Table (7). Effect of sage powder on hematological parameters on New Zealand White male rabbits at 13 weeks of age.

Traits		Experimental groups			SEM	P-value
		Control	Sage powder (0.25%)	Sage powder (0.5%)		
Red blood cells ($\times 10^6$)		4.27	4.43	5.09	0.48	0.498
WBCs differentia	Heterophil (%)	28.12	27.44	25.76	4.29	0.633
	Lymphocyte (%)	60.44	59.33	61.22	4.47	0.580
	Monocyte(%)	3.44	4.89	4.11	1.81	0.652
	Eosinophil (%)	5.89	5.55	5.58	1.22	0.461
	Basophil (%)	2.11	2.79	3.33	0.78	0.236
	Hemoglobin(mg/dl)	11.14 ^c	12.37 ^b	13.54 ^a	0.20	0.002

A, b and c Means with different superscripts in the same row are significantly different ($P \leq 0.05$), SEM= standard error of the mean, WBCs : white blood cells.

agreed with Al-Sherify and Al-Alwany (2016) found that the broiler diets contain sage leaves powder led to a significant amelioration on RBCs and Hemoglobin values as compared with the control group.

Biochemical constituents

The findings in Table (8) explained the Effect of sage powder on biochemical constituents with in normal range on New Zealand White male rabbits. The biochemical constituents such as total protein, albumin, glucose and T_3 increased significantly ($P < 0.05$) in the 3th group supplemented with 0.5% sage powder/ kg diet as compared with the 2nd and 1th groups.

Table (8). Effect of sage powder on biochemical constituents on New Zealand White male rabbits at 13 weeks of age.

Traits	Experimental groups			SEM	P-value
	Control	Sage powder (0.25%)	Sage powder (0.5%)		
Total protein(mg/dl)	4.16 ^b	4.61 ^b	5.61 ^a	0.22	0.021
Albumin (mg/dl)	2.44 ^c	3.07 ^b	3.58 ^a	0.13	0.008
Globulin (mg/dl)	1.71	1.54	2.03	0.09	0.079
Glucose (mg/dl)	95.02 ^c	109.00 ^b	130.67 ^a	2.22	0.001
T_3 (mg/dl)	67.27 ^c	86.88 ^b	109.47 ^a	3.37	0.002
T_4 (mg/dl)	4.86	5.74	6.26	0.63	0.374

A, b and c Means with different superscripts in the same row are significantly different ($P \leq 0.05$), SEM= standard error of the mean.

These findings were disagreed with Khalifa *et al.*(2024) who reported that the Tp and Album significantly decreased in blood of NZW male rabbits, which were fed diets contain 0.5 mg extract of sage plant / kg diet as compared with control group. Globulin and T₄ were didn't significantly affect with sage powder supplementation.

Conclusively, in the light of mentioned findings, it can be posited that the supplementation of Sage powder with 0.5% / kg diet is the best level for improve body weight and other growth performance of growing rabbits and thus can help to improve the industry of poultry especially rabbits growing .

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تأثير استخدام مسحوق أوراق الميرمية على الصفات الإنتاجية ، صفات الذبيحة و مقاييس الدم فى علائق ذكور ارناب النيوزيلاندي البيضاء

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هدفت هذه الدراسة إلى معرفة تأثير مسحوق أوراق الميرمية على الأداء الإنتاجي ، صفات الذبيحة و مقاييس الدم للآرناب النيوزيلاندي النامية . اشتملت هذه الدراسة على عدد ٤٥ من ذكور الارانب النيوزيلاندي النامية عمر ٥ اسابيع وكان متوسط الوزن الابتدائي 0.72 ± 0.72 جرام واستخدمت من (٥-١٣ اسبوع من العمر) هي فترة التجربة .قسمت الأرانب إلى ثلاث مجموعة بالتساوي وهي كالتالي المجموعة الأولى (كنترول) لم يتم وضع إي إضافات للعليقة ، المجموعة الثانية والثالثة تم إضافة ٠.٢٥ و ٠.٥% من مسحوق أوراق الميرمية /كجم عليقة على الترتيب .

أوضحت النتائج المتحصل عليه من الدراسة التالي :-

١- ازداد متوسطات اوزان الجسم فى عمر (٩ و ١٣ اسبوع من العمر) وكذلك معدل الزيادة الكلية واليومية فى وزن الجسم فى الفترات من (٥-٩) اسبوع من العمر فى المجموعة الثالثة التي تم إضافة (٠.٥%) للعليقة مقارنة بالمجموعة الثانية والكنترول.

٢- ازداد وزن الجسم ، ونسبة كلا من الكبد والكليتين ، ايضا ازداد تركيز البروتين الكلى ، الألبومين ، الجلوكوز و T3 فى المجموعة الثالثة التي تم إضافة (٠.٥%) للعليقة مقارنة بالمجموعة الثانية والكنترول.

التوصية :- نخلص من الدراسة أن افضل مستوى هو ٠.٥% من مسحوق أوراق الميرمية /كجم عليقة يمكن إضافته لتحسين وزن الجسم وايضا مقاييس النمو الاخرى ، صفات الذبيحة ومقاييس الدم فى ذكور ارناب النيوزيلاندي البيضاء

الكلمات المفتاحية :- مسحوق أوراق الميرمية ، مقاييس الدم وذكور أرناب النيوزيلاندي البيضاء.