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EFFECT OF DIETARY OLIVE LEAVES AND CHAMOMILE FLOWERS POWDER ON THE GROWTH PERFORMANCE AND CARCASS TRAITS AND OF BROILERS (SASSO BREED)

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ABSTRACT

The current work was conducted to evaluate the effect of feeding Olive leaves and chamomile flowers powders either single or in combination on growth performance, carcass traits, serum parameters and immune response of Sasso broilers. A total number of 126 one-day old unsexed Sasso chicks (average weight 35 g) were obtained from local commercial source and randomly distributed into 6 equal groups each of 21 chicks (7 chicks/replicate). In the first group, birds were fed ad-libitum on starter, grower and finisher basal control diets, while chicks in the second and third groups fed on diets supplemented with 1 & 2% olive leaves powder (OLP). Birds in the fourth and fifth groups fed diets containing 0.75 & 1% chamomile flowers powder, while broilers in the sixth group fed on diet supplemented with 2% olive leaves powder + 1% chamomile flowers powder. Control basal starter, grower and finisher diets were formulated according to guidelines of Sasso breed requirements. Birds were fed according to three phases program (starter, grower and finisher) for 70 days experimental period. Growth performance, carcass traits, serum biochemical and immune parameters were assessed. The results showed that, olive leaves powder supplemented groups (groups 2, 3), chamomile flower powder supplemented group (group 4) and birds in the sixth group (group 6) recorded higher body weight gain (1277.67 ± 33.42g, 1375.75 ± 46.07g, 1277.17 ± 50.30 and 1267.25 ± 37.12 g), respectively and best feed conversion (2.17, 2.03, 2.17 and 2.11) than that recorded by control group (1221.50 ± 47.29g & 2.26). Addition of olive leaves powder, chamomile flower powder or their combination to broiler diets had no significant effect ($p<0.05$) on dressing percentage or the relative weights of internal organ compared with the control group. Total serum protein and globulin were significantly increased, while albumin/globulin ratio was significantly decreased in the third group compared with control one. There were significant decreases in serum cholesterol levels in all treatment groups except fourth group, while there was significantly decrease in triglycerides level in sixth group in comparison with other groups and control group. Serum levels of malondialdehyde (MDA) were significantly decreased in the second, third and fourth groups, while there were no significant differences were observed in fifth and sixth groups. Serum catalase enzyme was significantly increased in the third and fourth groups compared with treated groups and control. WBCs counts and lymphocytes % were significantly increased in all treated groups except the third group which show no significant effect. The relative weights of bursa were significantly increased in all treated groups compared with control. There were significantly increased in the relative weight of thymus in third and fifth groups, while the relative weight of spleen significantly increased in fifth and sixth groups comparison with control. Results of the current study concluded that, the best growth performance and immune response were observed in broilers of the third group fed diet containing 2% olive leaves powder.

Key words: *Growth performance, carcass traits, broilers, Sasso breed*

INTRODUCTION

Phytogenic feed additives have received attention as possible replacements for antibiotic growth promoters (Huyghebaert *et al.*, 2011). Moreover, aromatic plants and their components in animal nutrition are potential to beneficially influence appetite and daily feed intake of broilers. Herbs and herbal products are incorporated in livestock feeds instead of chemical products in order to stimulate or promote the effective use of feed nutrients which result in more rapid gain, higher production and better feed efficiency (Ghazalah and Ali, 2008). Today, many studies focus on using of natural feed additives in poultry diets as antioxidant

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(Florou-Paneri *et al.,* 2006) or antimicrobial (Botsoglou *et al.,* 2010). Olive leaves are agricultural residues from the beating of olive trees (*Oleaeuropea L.*) for fruit harvest. Olive leaves contain many important substances as oleuropein, tyrosol and hydroxytyrosol (Silva *et al.,* 2006). Olive leaves have several pharmacological properties as immune-stimulator, antibacterial (Bisignano *et al.,* 2001), antifungal, anti-viral (Fredrickson, 2000), anti-inflammatory and antibacterial activities (Korukluoglu *et al.,* 2010) and antioxidant properties (Mujić *et al.,* 2011; Hamad, 2015). The addition of olive leaves to broiler diets resulted in a significant increase in weight gain and improved feed conversion (Fayed *et al.,* 2009; Erener *et al.,* 2009 and Lee-Huang *et al.,* 2011). El-Damarawy *et al.* (2013) observed that olive leaves powder supplementation at the level of 2.0% to Mandarah chick diets improved performance and most of immunological and biochemical traits. El-damrawy (2011) found that olive leaves extract was effective in minimizing the oxidative stress which was induced with the advance of thiobarbituric acid reactive substances (TBARS), superoxide dismutase (SOD) and glutathione s-transferase (GST). Amino acids, polysaccharides, fatty acids, essential oils, mineral elements, flavonoids and other phenolic compounds are the main constituents of chamomile. Chamomile shows different pharmacological activities like antibacterial, antifungal, antiviral and strong antioxidant properties (Al Bahtiti, 2012). Improvement in body weight gain and feed conversion of broilers fed chamomile flowers powder were reported by Galib *et al.* (2011) and Mahmoud (2013). Abaza *et al.* (2003) suggested that addition of 2.5 g/kg chamomile flower powder to broiler diet improved growth performance. The current work was conducted to evaluate the effect of feeding olive leaves powder and chamomile flowers either single or in combination on growth performance, carcass traits, blood biochemical parameters and immune response of Sasso broilers.

MATERIALS AND METHODS

The current work was carried out at the Teaching Veterinary Hospital, Department of Animal Nutrition and Clinical Nutrition, Faculty of Veterinary Medicine, Assuit University (March – May 2019).

Experimental chicks and housing:
126 one- day old unsexed Sasso chicks (average weight 35 g) were obtained from local commercial source, weighed and randomly distributed into 6 equal groups each of 21 chicks (7 chicks/replicate). The experimental room was previously disinfected with Cid 20 and floor area bedded with a layer of chaffed wood. The experimental pens were equipped with cylindrical plastic feeders, water founts, thermostatically controlled heaters and ventilation fans to maintain room temperature and air flow. Birds were kept under the same managerial system and environmental conditions. Broilers were vaccinated against New Castle viral disease and Infectious bursal disease via eye drops. Hygienic disposal of organic wastes was followed.

Experimental design:
Sasso chicks were experimented to study the effect of feeding olive leaves and chamomile flowers powder either single or in combination on growth performance, carcass traits, some blood biochemical parameters and immune response. Experimental design was shown in Table 1.

Table 1: The applied experimental design of the current work.

Treatments	Groups	Diets	Added level
T1	1	control	-
T2	2	olive leaves powder	1%
T3	3	olive leaves powder	2%
T4	4	chamomile flowers powder	0.75%
T5	5	chamomile flowers powder	1%
T6	6	olive leaves + chamomile flowers	2% +1%

Diets and feeding:
The standard basal control starter, grower and finisher diets were formulated in a mash form (yellow corn, soybean meal, corn gluten and sunflower oil) according to guidelines of Sasso breed requirements. In the first group, birds were fed ad-libitum on starter, grower and finisher basal control diets, while chicks in the second and third groups fed on the same diets supplemented with 1& 2% olive leaves powder. Birds in the fourth and fifth groups fed diets containing 0.75 & 1% chamomile flowers powder while, broilers in the sixth group fed on diet supplemented with 2% olive leaves powder + 1% chamomile flowers powder. Birds were fed

according to three phases feeding program (starter, grower and finisher) during 70 days experimental period. Sasso chicks were fed ad-libitum on the respective diets and given free access to fresh water throughout the experimental period. The physical and chemical composition and energy values of the feed ingredients and experimental diets are presented in Table (2&3).

Table 2: Chemical composition and metabolizable energy values of the feed ingredients.

Feed Ingredients	(%) Chemical composition As fed basis						*ME (kcal/kg diet)
	DM	CP	EE	CF	NFE	Ash	
Yellow corn, ground	87.71	8.60	3.70	2.11	72.00	1.30	3350
Soybean meal	89.75	44.60	1.90	6.55	32.00	4.70	2230
Sunflower oil	99.00	---	99.00	---	---	---	9000
Corn gluten meal	90.00	60.80	2.40	1.40	24.40	1.90	3720

* ME= Metabolizable energy cited by NRC (1994).

Table 3: Composition and energy value of the basal control diets.

Items	Starter	Grower	Finisher
Physical composition (%)			
Yellow corn, ground	56.03	62.10	66.60
Soybean meal	34.53	28.28	24.17
Sunflower oil	2.70	2.93	3.72
Corn gluten meal	2.83	3.29	2.48
Mono calcium phosphate	1.45	1.06	0.87
Limestone, ground	1.72	1.66	1.52
Common salt	0.3	0.3	0.3
Methionine	0.14	0.04	0.01
Premix	0.3	0.3	0.3
Chemical composition (%)			
Crude protein	22	20	18
Ether extract	5.47	5.82	6.70
Crude fiber	3.48	3.21	3.02
Calcium	1.0	0.90	0.80
available Phosphorus	0.45	0.35	0.30
Lysine	1.10	1.00	0.85
Methionine	0.50	0.38	0.32
Energy value:			
ME (kcal/kg diet)	3000	3100	3200

* Each 1.5 kg contains: Vit. A, 12000000 IU; Vit. D3, 4000000 IU; Vit. E, 50000 mg; Vit. k3, 4000 mg; Vit. B1, 5000 mg; Vit.B2, 8000 mg; Vit. B6, 5000 mg; Vit. B12, 35 mg; Vit. C, 450 mg; Niacin, 70000 mg; Methionine, 3000 mg; Pantothenic acid , 20000 mg ; Folic acid 1000 mg; Biotin, 250 mg; Magnésium, 100000 mg; Copper, 15000 mg; Iron, 50000 mg; Zinc, 50000 mg; Cobalt, 250 mg ; iodine 1500 mg and selenium 250 mg.

Growth performance parameters:

Live body weight of birds was individually recorded at the beginning of experiment and then weekly throughout the 10 weeks of the experimental period. Individual LBW was totalized and divided by the number of broilers to obtain the average LBW. Body

weight gain of broilers for each week was calculated by subtracting the LBW at the beginning of each week from that at the end of the same week. The amount of feed intake was weekly recorded in each of the different experimental groups and replicates. Average amount consumed by each bird was calculated by dividing the weekly consumed feed by its respective number of birds in each replicate and group at this week. FCR was calculated weekly as kg feed intake / kg of body weight gain.

Carcass traits:
At the end of the experiment, three birds from each group one from each replicate were slaughtered after fasting overnight, processed and the weight of dressed carcass (the weight of slaughtered birds after removal of feathers, head and feet but including all the edible offal's), liver, gizzard and heart were recorded. The weights of immune organs (bursa, spleen and thymus) were also recorded. Internal and immune organ weights were expressed as relative weight to pre-slaughter weight.

Blood sampling, hematological and serum Biochemical parameters:
Three blood samples were collected from the three slaughtered birds of each group in non-heparinized tubes. Serum was separated by centrifugation at 3000 rpm for 10 minutes and stored at -18°C till further analysis. Serum samples were assayed for estimation of total protein and its fractions (albumin and globulin), triglycerides, cholesterol, Malondialdehyde (MDA) and catalase enzyme by spectrophotometer using commercial test kits (Spectrum, Cairo, Egypt). Another three blood samples for hematological parameters were collected into well-labeled and sterilized bottles containing ethylene diamine tetra acetic acid (EDTA) as anti-coagulant. The samples were analyzed for the hematological parameters including white blood cell count (WBC) and differential leucocyte count according to (Schalm *et al*., 1975).

Statistical analysis:
The results were expressed as the mean ± SE. All data were analyzed using one way analysis of variances (ANOVA) followed by LSD test using SPSS 16.0 statistical software (SPSS, Inc, Chicago, IL, 2001), www.spss.com.

RESULTS

Growth performance measurements of broilers including body weight gains, feed consumption and feed conversion ratio during feeding intervals and whole experimental period are shown in Table, 4. Carcass traits including hot carcass %, eviscerated carcass %, dressing carcass % and percentages of some internal and immune organs are presented in Table, 5. Effect of olive leaves powder and chamomile flower powder addition to broiler diets on serum biochemical parameters and hematological parameters are tabulated in Tables 6&7.

Table 4: Growth performance of Sasso broilers during different experimental period intervals.

Group / Weeks	1	2	3	4	5	6
0-3 week:						
BWG	202.25±4.83	210.33±8.94	220.33±13.32	215.5±8.02	200.75±6.73	209.25±6.67
Feed intake	240.0±7.81	237.0±5.23	245.0±7.81	244.0±7.81	241.0±7.81	252.0±7.23
Feed conversion	1.19±0.03	1.13±0.05	1.11±0.06	1.13±0.04	1.20±0.04	1.20±0.03
3-6 weeks:						
BWG	345.83±16.06^{c}	375.42±12.00^{b}	434.58±14.11^{a}	359.17±16.15^{bc}	331.67±15.24^{c}	381.25±15.08^{ab}
Feed intake	808.0±11.29	823.3±11.28	811.3±11.06	802.3±11.23	726.3±11.28	730.0±11.01
Feed conversion	2.34±0.11^{ab}	2.33±0.08^{ab}	1.87±0.06^{c}	2.23±0.13^{a}	2.19±0.09^{bc}	1.91±0.09^{c}
6-10 weeks:						
BWG	673.42±30.01^{b}	691.92±18.24^{ab}	720.83±23.41^{a}	702.50±29.27^{a}	688.33±22.33^{c}	78.75±20.45^{ab}
Feed intake	1706.0±11.90	1715.3±11.97	1738.3±11.89	1719.0±11.92	1760.3±12.03	1695.0±11.90
Feed conversion	2.53±0.13^{b}	2.48±0.07^{bc}	2.41±0.08^{c}	2.45±0.11^{bc}	2.56±0.17^{a}	2.50±0.07^{b}
0-10 weeks:						
BWG	1221.50±47.29^{c}	1277.67±33.42^{ab}	1375.75±46.07^{a}	1277.17±50.30^{ab}	1220.75±38.85^{c}	1267.25±37.12^{ab}
Feed intake	2754.7±7.88	2775.0±4.09	2794.0±7.88	2765.0±7.88	2727.0±7.88	2677.0±20.10
Feed conversion	2.26±0.09^{a}	2.17±0.21^{b}	2.03±0.07^{c}	2.17±0.09^{b}	2.23±0.10^{a}	2.11±0.06^{ab}

***** Figures in the same row having the same superscripts are not significantly different (P<0.05)

Table 5: Carcass trait and organ weights of broilers fed different experimental diets.

Carcass traits \ Group	1	2	3	4	5	6
Pre-slaughter Wt.(g)	1121.7±57.0	1155.00±37.53	1215.00±59.23	1158.33±95.28	1135.00±50.08	1208.33±25.22
Hot carcass (%)	79.88±1.08	81.05±0.74	80.43±0.49	79.89±0.37	80.22±0.86	80.81±0.54
Eviscerated carcass%	64.88±2.42	62.82±1.48	62.90±1.15	62.43±1.47	62.57±0.20	64.14±0.75
Dressed carcass %	70.22±3.12	68.34±1.16	67.47±0.95	67.80±0.97	67.94±0.51	68.98±0.82
Liver %	2.29±0.24	2.16±0.12	2.45±0.15	2.26±0.25	2.13±0.13	1.97±0.07
Heart%	0.61±0.03	0.62±0.06	0.56±0.04	0.55±0.04	0.63±0.09	0.59±0.07
Gizzard%	2.26 ± 0.02^{ab}	2.62 ± 0.21^{a}	2.50 ± 0.29^{ab}	1.87 ± 0.13^{b}	2.44 ± 0.15^{ab}	2.49 ± 0.41^{ab}
thymus %	0.56 ± 0.051^{bc}	0.68 ± 0.09^{ab}	0.74 ± 0.12^{a}	0.60 ± 0.05^{b}	0.82 ± 0.12^{a}	0.51 ± 0.18^{c}
Spleen %	0.29 ± 0.06^{ab}	0.21 ± 0.01^{c}	0.23 ± 0.01^{c}	0.29 ± 0.06^{ab}	0.32 ± 0.06^{a}	0.30 ± 0.03^{a}
Bursa%	0.03 ± 0.09^{c}	0.15 ± 0.0^{b}	0.26 ± 0.08^{a}	0.18 ± 0.07^{ab}	0.16 ± 0.05^{ab}	0.15 ± 0.01^{b}

***** Figures in the same row having the same superscripts are not significantly different (P<0.05)

Table 6: Serum biochemical parameters of broilers fed different experimental diets.

Serum parameters \ Group	1	2	3	4	5	6
Total protein (g/dl)	4.03 ± 0.01^{c}	4.13 ± 0.01^{bc}	4.99 ± 0.05^{ab}	3.94 ± 0.02^{c}	4.24 ± 0.03^{bc}	4.11 ± 0.03^{bc}
Albumin (g/dl)	1.37±0.25	1.53±0.27	1.28±0.13	1.54±0.15	1.40±0.17	1.54±0.21
Globulin (g/dl)	2.66 ± 0.27^{bc}	2.60 ± 0.29^{bc}	3.70 ± 0.18^{ab}	2.40 ± 0.17^{bc}	2.84 ± 0.20^{bc}	2.57 ± 0.22^{bc}
Alb/Glob ratio	0.55 ± 0.15^{ab}	0.63 ± 0.18^{ab}	0.35 ± 0.05^{b}	0.66 ± 0.11^{ab}	0.51 ± 0.10^{ab}	0.62 ± 0.13^{ab}
Cholesterol (mg/dl)	167.32 ± 2.38^{a}	105.59 ± 2.90^{c}	132.93 ± 1.11^{b}	144.07 ± 0.62^{ab}	136.86 ± 0.49^{b}	112.24 ± 1.18^{bc}
Triglyceride (mg/dl)	68.53 ± 0.42^{a}	60.38 ± 0.63^{ab}	62.47 ± 0.27^{ab}	65.13 ± 0.42^{a}	63.41 ± 0.03^{ab}	55.64 ± 0.54^{b}
MDA (μmol/ml)	7.72 ± 0.07^{a}	6.43 ± 0.07^{bc}	6.38 ± 0.05^{b}	5.66 ± 0.03^{c}	6.73 ± 0.01^{ab}	8.57 ± 0.85^{a}
Catalase enzyme	157.13 ± 8.24^{bc}	135 ± 0.82^{bc}	248.73 ± 4.14^{a}	278.74 ± 1.25^{a}	255.69 ± 0.81^{b}	240.57 ± 4.11^{bc}

***** Figures in the same row having the same superscripts are not significantly different (P<0.05).

Table 7: Differential leucocytic cell of broilers fed different experimental diets.

Group / Blood parameters	1	2	3	4	5	8
WBCs (103/mm3)	14.67±1.13^{c}	16.67±0.93^{b}	14.33±1.20^{c}	19.55±0.03^{a}	16.10±0.06^{b}	19.95±0.84^{a}
Lymphocytes %	75.00±2.89^{b}	88.33±1.67^{a}	75.00±2.89^{b}	89.00±3.46^{a}	86.50±3.18^{a}	91.00±1.73^{a}
Segment %	17.50±1.44	18.50±0.29	23.50±0.29	15.00±0.58	13.50±0.2	7.50±1.44
Eosinophils %	1.00±0.58	1.00±0.30	0.5±0.32	0.5±0.31	0.30±0.29	0.33±0.30
Monocytes %	1.00±0.58	1.00±0.29	0.5±0.58	1.33±0.33	1.00±0.33	1.50±0.29

***** Figures in the same row having the same superscripts are not significantly different (P<0.05)

DISCUSSION

Growth performance:

There were a significant differences (p<0.05) in the body weight gains and feed conversion ratios between the different experimental groups and control as shown in Table 4. At the end of the experimental period, olive leaves powder supplemented groups (groups 2&3) and 0.75% chamomile flowers powder supplemented group (group 4) and birds in the sixth group fed on a combination of olive leavers powder and chamomile flowers powder recorded higher body weight gain (1277.67±33.42g, 1375.75±46.07g, 1277.17±50.30 and 1267.25±37.12 g) and best feed conversion (2.17, 2.03, 2.17 and 2.11), respectively compared to control group (1221.50±47.29g & 2.26). The highest body weight gain and best feed conversion ratio were recorded in the third group fed on diet supplemented with 2.0% olive leaves powder (1375.7g & 2.03), while the lowest values were recorded in the control group. Similar results were obtained by Bouaziz *et al.* (2008), El-damarawy *et al.* (2013), Bahsi *et al.* (2016), Ait-Kaki *et al.* (2018) and Nafea & Hussein (2018) who reported that, the addition of olive leaves powder to broiler diets at level of 20 or 25 g/kg diet resulted in a significant increase in the body weight gain and improved feed conversion. Current results also supported by the findings of Al-kaisse & khalel (2011) and Ibrahim *et al.* (2018) who found that the addition of chamomile flowers powder at level of 0.75% to broiler diets increased significantly body weight gain and improved feed conversion. Abaza *et al.* (2003) stated that addition of 0.25% chamomile flowers to broiler diets improved body weight gain. The benefits of dietary olive leaves are possibly due to the presence of polyphenols and particularly oleuropein, the main active component in this material (Malik & Brandford, 2008). Olive leaves powder contain phenolic compounds that have a structure and function similar to the steroid hormones. Steroid hormones and phenolic compounds increase the basic metabolic rate and have a role in improving the digestibility of feeds, thus increasing the utilization of nutrients in the diet (Guinda *et al.*, 2004). Chamomile flowers powder have endocrine stimulating effect via enhancement of thyroxin hormone activity with consequence acceleration of nutrients metabolites resulted in an increasing body weight (AL-Hamo *et al.*, 2003). In addition, anti-inflammatory, antimicrobial, antioxidant and antifungal effects of chamomile flowers that attributed to presence of some essential compounds resulted in improvement of body weight gain (Santurio *et al.*, 2007). On the other hand, Govaris *et al.* (2010), Shafey *et al.* (2013), Sarica & Toptas (2014) and Ait-Kaki *et al.* (2018) found that, dietary supplementation of olive leaves powder had no significant effect on body weight gain and feed conversion ratio. No significant differences were observed in body weight gain of broilers fed diet supplemented with 1.0% chamomile flowers powder (Ahmed *et al.*, 2015). Al-kaisse & khalel (2011) and Mahmoud (2013) reported that, adding of chamomile flowers at the levels of 1% increased body weight gain significantly. Jakubcova *et al.* (2014) found that, the addition of chamomile extract to the broiler diets at the levels of (0.3 and 0.6) % had no significant effect on body weight gain, while birds fed on diet supplemented with 1% chamomile flower recorded lower body weight gain which might be attributed to the anti-nutritional components of chamomile like tannin. Tanin leads to lack of sufficient nutritional absorption in the intestine. On the contrary, Al-kaisse & khalel (2011) and Mahmoud (2013) reported that adding of chamomile flowers at the levels of 1% increased body weight gain significantly. On the other hand, Ahmed *et al.* (2015) found no significant differences were observed in body weight gain of broilers fed diet supplemented with 10g/kg chamomile flowers.

Addition of olive powder and chamomile flowers powder single or in combination had no significant effect on feed intake of Sasso broilers during feeding intervals or whole experimental period compared with control as shown in Table 4. Similar results were recorded by El-damarawy *et al.* (2013), Shafey *et al.* (2013), Sarica & Toptas (2014), Cayan and Erener (2015), Rezar *et al.* (2015) and Ait-Kaki *et al.* (2018) who reported that olive leaves powder had no significant effect on feed intake. On the contrary Al-kaisse & khalel (2011) found that adding of chamomile flowers at the levels of 1% decrease feed intake significantly, while, Nafea & Hussein (2018) showed that, adding olive leaves at the levels of 5 and 10 g/kg diet significantly increase feed intake.

Carcass traits:

The inclusion of olive leaves powder and chamomile flowers powder into the sasso broilers diets did not affect significantly on the hot carcass %, eviscerated carcass%, dressing% and relative weights of liver, gizzard and heart (Table 5). Similar results were obtained by Shafey *et al.* (2013) and Ait-Kaki *et al.* (2018) who found that, adding different levels of olive leaves did not have any significant effect on eviscerated carcass and edible offal weights. Sarica and Toptas (2014) reported that, oleuropein supplementation at the levels of 50, 100, 150 and 200 mg/kg had not affect on the relative weights of some digestive organs. Al-kaisse & khalel (2011), Mahmoud (2013), Jakubcova *et al.* (2014) and Ahmed *et al.* (2015) observed that, the addition of different levels of chamomile flowers had no significant effect on relative weight of internal organs. On the contrary, Ibrahim *et al.* (2018) reported that, adding chamomile flowers at the levels of 0.75% to ducks diet increased carcass weight, gizzard weight and giblet weights. El-damarawy *et al.* (2013) found that, chicks fed on diet supplemented with 2% olive leaves decreased significantly the relative weight of liver compared with control one.

Serum biochemical parameters:

Serum biochemical values revealed a significant differences ($p<0.05$) among the experimental groups as shown in Table 6. Total serum protein and globulin were significantly increased, while albumin/globulin ratio were significantly decreased in the third group compared to control one. These results are in harmony with the findings of El-damarawy *et al.* (2013) and Nafea & Hussein (2018) who reported that, chicks fed on diet supplemented with 2% olive leaves had significant increase in serum protein and globulin levels. On the other hand, Ait-Kaki *et al.* (2018) stated that, adding different levels of olive leaves did not affect significantly on total serum protein level of broilers. Ahmed *et al.* (2015) showed that, no significant differences were observed in total protein levels in broilers fed on diet supplemented with 10g/kg chamomile flowers. Ibrahim *et al.* (2018) reported that, adding chamomile flowers at the levels of 0.50, 0.75% to ducks diet significantly increase globulin, albumin and total protein levels. Results also indicated that, there was a significant decrease in serum cholesterol levels in all treatment groups except fourth group, while there was significantly decrease in triglycerides level in sixth group in comparison with control. Hypercholesterolemia may be due to the inhibition of dietary cholesterol absorption in the intestine or its production by liver or stimulation of the biliary secretion of cholesterol and cholesterol excretion in the feces (Jemai *et al.*, 2008). Similar effects were recorded by El-damarawy *et al.* (2013) and Nafea & Hussein (2018) who reported that, serum cholesterol and triglycerides levels of birds fed on diet supplemented with olive leaves were significant decreased in comparison with control one**.** Also**,** Ahmed *et al.* (2015) showed that, a significant decrease in serum cholesterol and triglycerides levels were observed in broilers diet supplemented with 10g/kg chamomile flowers. On the other hand, Ait-Kaki *et al.* (2018) stated that adding different levels of olive leaves to broiler diets did not have any significant effect on triglycerides levels.

Oxidative status and immune response.

Serum levels of malondialdhyde (MDA) were significantly decreased in the second, third and fourth groups while no significant differences were observed in the fifth and sixth groups as shown in Table 6. Serum catalase enzyme was significantly increased in the third and fourth groups compared with other treated groups and control. These results are in harmony with the findings of Ahmed *et al.* (2017) and Oke *et al.* (2017) who found that, adding different levels of olive leaves powder to broiler diets significantly decreased malondialdhyde (MDA) concentration. Ahmed *et al.* (2015) stated that, diets supplemented with 10g basil, 10g chamomile and 5g basil plus 5g chamomile per kg significantly decreased the serum level of malondialdehyde, whereas the activities of catalase was significantly increased ($P<0.05$). The antioxidant effects of olive leaves are related to phenolic compounds which considered free radical scavenger by breaking the free radical chain reaction (Lee & Lee, 2010 and Hayes *et al.*, 2011). Silva *et al.* (2006) and Jemai *et al.* (2008) reported that, olive leaves or olive leaves extract are a source of many phytochemicals which considered as potential sources of antioxidant.

The effect of olive leaves and chamomile flowers supplementation on immune response of Sasso broilers are presented in Table 7. WBCs counts and lymphocytes % were significantly increased in all treated groups except third group fed on 2% OLP. Obtained results indicated that, there were no

significant differences in segment %, Eosinophils % and Monocytes % between all treated groups. Concerning the weights of immune organs, there were significantly increased in thymus weight in the third and fifth groups, while the weight of spleen significantly increased in the fifth and sixth groups in comparison with control. The weights of bursa were significantly increased in all treated groups compared with control as shown in Table 5. These results are in agreement with the findings reported by El-Damarawy *et al.* (2013), Parasei (2014) and Ahmed *et al.* (2017) who found that, white blood cells counts, lymphocytes % and the relative weights of bursa and spleen were significantly ($p<0.01$) increased in broiler fed on diet supplemented with oleuropein. Dada *et al.* (2015) reported that, addition of chamomile powder at levels of 4 g/kg were significantly increased percentage of bursa of fabercius weight ($P<0.05$). Opposite results were obtained by Oke *et al.* (2017) who found that, chicks fed diets supplemented with olive leaves powder had no significant effect on white blood cells (WBC) and lymphocyte. Al-Kaisse & Khalel (2011) stated that, addition of 0.25, 0.50, 0.75 and 1% of chamomile flowers powder to broiler diets had no effect WBC count. The relative weights of spleen and bursa were significantly not affected by addition of basil and chamomile to broiler diets (Ahmed et al., 2015). Herbs may influence immune system via four mechanisms including activation of phagocytic property, stimulation of fibroblasts, increscent of respiratory activity and leukocyte movement which influence gastrointestinal mucosal lymphocyte and also stimulate local immunity (Bauer *et al*., 1989).

CONCLUSION

The results of the current study concluded that the best growth performance and immune response were observed in broilers of the third group fed diet containing 2% olive leaves powder.

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تأثير استخدام مسحوق أوراق الزيتون وزهرة البابونج علي كفاءة الأداء وخواص الذبيحة والاستجابة المناعية لبدارى التسمين (سلالة الساسو).

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أجريت هذه الدراسة لمعرفة تأثير استخدام مسحوق اوراق الزيتون وزهرة البابونج منفردة او مجتمعة علي كفاءة الأداء وخواص الذبيحة وبعض التغيرات البيو كيميائية والاستجابة المناعية في بدارى التسمين سلالة الساسو. تم استخدام عدد ١٢٦ كتكوت تسمين ساسو في عمر يوم (متوسط الوزن ٣٥ جم) من مصدر تجاري محلي وقسمت عشوائيا إلي ٦ مجموعات بكل منها عدد ٢١ كتكوت (عدد ٣ مكررات بكل منها ٧ كتاكيت). تم تغذية كتاكيت المجموعة الاولى على العليقة الضابطة الاساسية (البادي- النامي –الناهي) بدون اضافة أيا من مسحوق اوراق الزيتون او زهرة البابونج في حين غذيت الطيور في المجموعة الثانية والثالثة على نفس العليقة الضابطة مضافا اليها ١% , ٢% من مسحوق اوراق زيتون. الطيور في المجموعة الرابعة والخامسة غذيت علي نفس العليقة الضابطة مضافا اليها ٠,٧٥% , ١% من مسحوق زهرة البابونج في حين غذيت طيور المجموعة السادسة علي خليط من مسحوق اوراق الزيتون ٢% + مسحوق زهرة البابونج ١%. تم تكوين العليقة الضابطة الاساسية خلال مراحل البادئ والنامي والناهي علي حسب الاحتياجات سلالة الساسو وغذيت الطيور عليها لمدة ٧٠ يوم. تم تقييم كفاءة الأداء وخواص الذبيحة وتم تقدير بعض التغيرات البيوكيميائية في دم الطيور وكذلك تم قياس الاستجابة المناعية وتم الحصول على النتائج التالية: سجلت الطيور التي تم تغذيتها علي علائق بها تركيزات ١ , ٢ % مسحوق اوراق زيتون و٠.٧٥% مسحوق زهرة البابونج والخليط زيادة معنوية في معدلات النمو (١٢٧٧.٦٧ ± ٣٣.٤٢ , ١٣٧٥.٧٥ ± ٤٦.٠٧ , ١٣٧٥.٧٥ ± ٤٦.٠٧ , ١٢٧٧.١٧ ± ٥٠.٣٠ , ١٢٦٧.٢٥ ± ٣٧.١٢) على الترتيب وتحسن في معدلات التحويل (٢.١٧ , ٢.٠٣, ٢.١٧, ٢.١١) مقارنة بالمجموعة الضابطة (١٢٢١.٥٠ ± ٠.٤٧ و ٢.٢٦). لم يلاحظ أي فروق معنوية ذات دلالة احصائية في نسبة التصافي والوزن النسبي للأعضاء الداخلية (الكبد والقونصة والقلب) بينما سجلت النتائج زيادة معنوية في نسبة البروتين الكلى ونسبة الجلوبيولين ونقص معنوي في النسبة بين الالبيومين والجلوبيولين في المجموعة الثالثة مقارنة بالمجموعات المختبرة الاخرى والمجموعة الضابطة. كما لوحظ نقص معنوي في مستوى الكولسترول في كل المجموعات المختبرة ما عدا المجموعة الرابعة في حين سجلت المجموعة السادسة نقص معنوي في مستوي الدهون الثلاثية مقارنة بالمجموعات الاخرى والمجموعة الضابطة. اظهرت النتائج نقص معنوي في مستوي الميلانوالدهيد في المجموعات الثانية والثالثة والرابعة في حين سجلت النتائج زيادة معنوية في مستوى الكتاليز انزيم في المجموعات الثالثة والرابعة مقارنة بالمجموعة الضابطة. سجلت النتائج ايضا زيادة معنوية في الوزن النسبي لغدة فبريشيس في كل المجموعات بينما سجل الوزن النسبي للغدة التيموسية زيادة معنوية في المجموعة الثالثة والمجموعة الخامسة مقارنة بالمجموعات المختبرة الاخرى والمجموعة الضابطة. خلصت نتائج الدراسة الى ان معدلات الاداء والاستجابة المناعية كانت افضل ما يمكن فى طيور المجموعة الثالثة المغذاة على عليقة مضافا اليها ٢% مسحوق اوراق الزيتون.