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EFFECT OF DIFFERENT FEED ADDITIVES OF OPTIFEED, OLEOBIOTEC AND VEO PREMIUM ON THE PRODUCTIVE PERFORMANCE OF BROILERS UNDER HEAT STRESS CONDITIONS IN DOHUK GOVERNORATE

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ABSTRACT

This study was conducted at the University of Duhok, College of Agricultural Engineering Sciences, Animal Production Department. , to estimate the effect of different programs of adding the phytogenic (Optifeed, Oleobiotec and Veo premium) which are nutritional plant materials that have ability to improve the productive performance of broiler, and that in the phases of broiler feeding: starter, grower , finisher and for the whole period of the experiment, as well as, carcass characteristics and economic efficiency at 35 days of age. 1440 one-day old chicks were distributed to five groups with six replicates for each group (48 chicks/replicate). Adding dietary phytogenic materials significantly ($P<0.05$) improved broiler performance at grower, finisher and during whole experimental period (35) days compared to control. Regarding the carcass characteristics and internal organs, all treatments significantly ($P<0.01$) increased dressing percentage compared to control group (basal diet), while all other carcass characteristics and internal organs did not significantly affected by phytogenic dietary supplementation. Concerning economic efficiency, all phytogenic dietary supplementation resulted in improved profit compared to the basal diet.

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INTRODUCTION

In most regions of the world, meat and their products intake carry on to increase and particularly in developing nations (Taha *et al.*, 2021), Poultry meat consumption is expected to be raised by 60% over the next 20 years (Ali and al-Sardary, 2019), Poultry farms are an important contributor to the human food chain, worldwide, humankind keeps an enormous number of broiler chicken for meat providing a rich source of protein and low fat (Mustafa and Mohammed, 2020). Some natural products such as herbs, spices and several extracts of plant may improve the performance of broiler by acting as an antibiotic (Hernandez *et al.*, 2004). It seemed feed efficiency aiming to reduce the production cost of the meat (Abbas and Ahmed, 2010). The different plant extraction (spices and herbs) have antimicrobial effect as well as

stimulating property of digestion and appetizing (Alcicek *et al.,* 2003 and manan *et al.,* 2012). There has been an increasing awareness of the nutritive antibiotics ban that is consumed in Europe, which consumers require safe and natural substances in a food additive to obtain better farm animals' production. Plant herbs and spices extraction that is used in nutrition of animals as stimulants of digestion and appetite,stimulate physiological functions, treatment and prevention of some pathological conditions, like antioxidants and colorants. This study is exit in a literature observation of plant extract usage in poultry (FrAnKIČ *et al.,* 2009). The different extraction of plant and spices have achieved a rising in additive growth promoter references. There are some aromatic plants whose essential oils are used in food and medicine manufacturing references. Moreover, to their antioxidants and antimicrobial activity increases production, improving the enzymes digestion and enhancing the function of the liver (Hernandez *et al.*, 2004 and Alagawany *et al.,* 2021). The feed supplement with spices and herbs or their extraction to increase stimulants, and know the preferences of taste of various species of animal (Janz *et al.,* 2007 and Wali *et al.,* 2022). Therefore, Optifeed® and Oleobiotic® products are designed to stimulate animal voluntary feed intake. Indeed, intensive animal production generates various stressors that stimulate the oropharyngeal receptors which are directly linked to the appetite center located in the hypothalamus. Mobilization of the corticotropic axis lasts 30 minutes on average. Generally, the immune system obtain benefits from the carotenoids and flavonoids which is present in spices and herbs feed additive can be used as natural non-antibiotic growth promoters, which is obtained from herbs, spices, essential oils and oleoresins because have immune-stimulant effects in poultry production and meat quality (Yitbarek, 2015), which leads to increased price in the end market and cost-efficacy of their application in the animal industry (Stevanović *et al*., 2018). Therefore, the aim of this study was to evaluate the effects of using phode additives on performance of broiler chicks in response to Phode feed additives, verify the claims of the manufacturers regarding the desirable effects of these additives in broiler ration under local and stress conditions, to study the economics of adding the feed additives in broiler ration and to recommend suitable feed additive program for use in broiler rations.

MATERIALS AND METHODS

A total of 1440 one-day old chicks were obtained from Taq Taq project and transported by a special car from Erbil to the Poultry farm/ College of Agricultural Engineering Sciences / the University of Duhok. Chicks were distributed to five groups (treatments) with six replicates for each treatment (48 chicks). At chick's arrival, average initial body weights were taken and then sugar solution (4%) and feed are provided. After 4 hours an antibiotic (lincomycin and lincospectin 1 g/L) + vitamin AD3E (200 mL/1000 L) was administered for 5 days. At the end of each period (starter 1-11 days, grower 12- 23 days, and finisher 24 – 35 days) live body weight (all chicks in each replicate), feed intake, and mortality were taken. The temperature was 35 – 40 ºC during the entire trial. At the end of the trial, two chickens from each replicate were chosen randomly then slaughtered manually for recording the carcass traits.

FEED PREPARATION

Feed was obtained (starter, grower and finisher) from the Amedi feed factory in mash form and mixed with the Optifeed (500gm /ton), Oleobiotic 100gm/ ton) and VeO (250gm / ton) depending on the treatments. Fresh feed was prepared every few days by adding the required amount of product to 50 kg. To homogenize this mixture, the required amount of product was first mixed with 2 kg, then this mixed in 10 kg, next it was mixed with 13 kg and finally with 25 kg (50 kg in total) (by manual mixing), and the trial program for treatments were as follows:

T1: (Control): birds were reared on basal diet (no feed additives)

T2: birds were reared on basal diet + Optifeed®POULTRY (500gm/ton) in the starter feed + Oleobiotic®POULTRY (100 gm/ton) during all the cycle (starter, grower and finisher feeds)

T3: birds were reared on basal diet + Optifeed®POULTRY (500gm/ton) in the starter feed and then Oleobiotic®POULTRY (100 gm/ton) in both grower and finisher feeds.

T4 : birds were reared on basal diet + Optifeed®POULTRY (500gm/ton) in the starter feed and then VéO®Premium (250 gm/ton) in both grower and finisher feeds.

T5: birds were reared on basal diet + Optifeed®POULTRY (500gm/ton) in the starter feed and then both VéO®Premium (250 gm/ton) and Oleobiotic®POULTRY (100 gm/ton) in both grower and finisher feed.

Vaccination programs

Chicks were vaccinated according to the commercial farm vaccination program available and followed in Duhok. On the 7th day, birds were vaccinated with Infectious Bronchitis (IB) + Newcastle (B1) (Intervet SP product). On the 14th day they were vaccinated with Gumboro (IBD) (StrainD78, Intervet SP product). At 21day they were vaccinated with Newcastle (La Sota strain, Intervet SP product). These vaccines were applied in drinking water

Statistical analysis

All results were statistically analyzed by General Linear Models (GLM), one-way analysis of variance, using SAS software (SAS, 2010). Differences among means were separated using Duncan's multiple range tests at ($P<0.05$) .

Table (1): Ingredients of the feed used in the trial.

Ingredients	**Starter (kg)**	**Grower (kg)**	**Finisher (kg)**
Soybean meal (46%)	353	275	203
Yellow	486	580	655
Oil	23	26	26
wheat flour	75	60	60
Protein	50	50	50
Limestone	15	14	12
Di calcium phosphate	8	8	8
Enzyme	0.750	0.5	0.750
Anti-toxin	1	3	1.5
Lysine	1.1	0.750	0.300
Colin	0.250	0,250	0.250
Threonine	0.750	0.5	0,250
Carbonate	2	2	2
Premix	4	2	2
Estimated composition			
Moisture (%)	11.57	11.78	11.72
Crude protein (%)	22.49	20.65	19.5
Energy Kcal/kg	2966	3055	3104
Fat (%)	2.97	3.36	3.65
Fiber (%)	2.18	2.64	2.98
Ash (%)	4.83	3.34	3.56
Starch (%)	44.22	46.29	47.87
Sugars (%)	4.02	3.87	3.90
Calcium (%)	1.12	0.97	0.85
Available phosphorous (%)	0.58	0.53	0.48

RESULTS AND DISCUSSION

Chicks performance in starter phase (1-11) days

Table (2) shows the effect of some feed additives on broiler performance in starter period (1-11) days. different feed additives have no significant effect on average body weight, weight gain, feed intake and feed conversion ratio. However, mortality percent was significantly affected as in all treatments the mortality rate has decreased compared with control, and the best result was for T5 (1.04 %). The results were in agreement wiith Mustafa *et al.*, (2019) who found that adding oleobiotec and optifeed significantly ($P<0.05$) decrease mortality percentage at starter stage compared to control group. While our results were in contrary to findings of Mustafa *et al.*, (2019) who found that adding opifeed and oleobioctec in broiler diet at the starter stage significantly ($P<0.05$) improved broiler performance.

Table (2): Effect of some phytogenic feed additives on broiler performance

Treatments / Parameters	T1	T2	T3	T4	T5	Sem	P value
Body weight(gm)	289.14	283.34	300.13	295.96	285.32	3.58	0.371
Weight gain (gm)	237.36	239.44	256.37	251.71	241.47	3.59	0.389
Feed intake(gm)	324.8	329.01	328.87	323.68	326.22	2.39	0.948
FCR (kg/kg)	1.368	1.368	1.281	1.291	1.345	0.015	0.230
Mortality %	5.2 a	3.12 ab	2.42 b	1.38 b	1.04 b	0.44	0.014

[a,b,c] Within the same row different letter mean significantly differ at ($P<0.05$).

T_1: (Control): basal diet (no feed additives), T_2: basal diet + 500g Optifeed/ton in starter feed + 100 g Oleobiotec /ton during all phases of feeding. T_3: basal diet + 500g Optifeed/ton in the starter feed +100 g Oleobiotec/ton in both grower and finisher feeds. T_4: basal diet + (500g Optifeed/ton in the starter feed + (250 g VéOPremium/ton in both grower and finisher feeds. T_5: basal diet + 500g Optifeed/ton in the starter feed + both 250 g VéOPremium/ton and 100 g Oleobiotec/ton in both grower and finisher feeds.

Broiler performance in grower phase 12-23 days.

Table (3) shows the effect of different feed additives on broiler performance during the grower phase. In general, the different feed additives significantly($P<0.01$) improved the average body weight, weight gain, feed intake, FCR compared with control. Results were agreed with the findings of Mustafa *et al* (2019) who found that adding optifeed and oleobiotec to boiler diet at grower stage significantly ($P<0.05$) improved live body weight, feed intake, FCR compared with chicks feed basal diet. While our results were contrary to findings of Ali *et al.*, (2019) who found that adding optifeed, oleobioctic and veo to broiler diet reared under heat stress conditions had no significant effect on the weight gain, feed intake and feed conversion ratio compared with broiler fed basal diet. Furthermore, Mustafa *et al.*, (2019) estimated that adding a mix of optifeed

and oleobiotec to broiler diet significantly (P<0.05) improved body weight, weight gain, feed intake and feed conversion ratio compared with broilers fed the basal diet.

Table (3): Effect of different feed additives on broiler performance during grower phase from 12- 23 days.

Treatments / Parameters	T1	T2	T3	T4	T5	Sem	*P* value
Body weight (gm)	590.18 c	671.22 b	727.79 a	767.42 a	733.13 a	13.85	0.0001
Weight gain(gm)	309.19 c	387.88 b	427.65 ab	471.46 a	447.81 ab	13.70	0.0001
Feed intake(gm)	583.92 c	637.97 bc	701.18 ab	773.93 a	745.36 a	17.35	0.0003
FCR	1.903 a	1.649 b	1.639 b	1.650 b	1.669 b	0.022	0.0001
Mortality %	5.72	2.33	4.29	5.6	2.81	0.48	0.064

[a,b,c] Within the same row different letter mean significantly differ at (P<0.05).

T_1: (Control): basal diet (no feed additives), T_2: basal diet + 500g Optifeed/ton in starter feed + 100 g Oleobiotec /ton during all phases of feeding. T_3: basal diet + 500g Optifeed/ton in the starter feed +100 g Oleobiotec/ton in both grower and finisher feeds. T_4: basal diet + (500g Optifeed/ton in the starter feed + (250 g VéOPremium/ton in both grower and finisher feeds. T_5: basal diet + 500g Optifeed/ton in the starter feed + both 250 g VéOPremium/ton and 100 g Oleobiotec/ton in both grower and finisher feeds.

Broiler performance in finisher phase 24-35 days.

Table (4) shows the effect of different phytogenic feed additives on the broiler performance during finisher phase. Different feed additives had a significant (P<0.05) effect on average body weight, weight gain and FCR. While different feed additives programs had no significant effect on feed intake, and mortality rate. Our results were in line with the findings of Ali *et al.*, (2019) who found that adding optifeed, oleobioctic and veo to broiler diet at finisher stage and reared under heat stress conditions significantly (P<0.05) improved weight gain, feed intake and feed conversion ratio compared with broiler fed the basal diet. Additionally, Mustafa *et al.*, (2019) state that adding mix of optifeed and oleobiotic in broiler diet, significantly (P<0.05) improved body weight, weight gain, feed intake and feed conversion ratio compared with broilers fed a basal diet. Regarding to mortality percentage our finding were in contrary with results of Mustafa *et al.*, (2019) who found adding mix of oleobiotic and optifeed to broiler diet at the finisher stage significantly (P<0.05) decreased mortality percentage compared to control.

Table (4): Impact of some feed additives on broiler performance in finisher phase from 24- 35 days.

Treatments / Parameters	T1	T2	T3	T4	T5	Sem	*P* value
Body weight (gm)	1510.20 c	1695.55 b	1751.67 ab	1790.83 a	1765.21 a	21.05	0.0001
Weight gain (gm)	919.81 b	1023.77 a	1023.88 a	1023.42 a	1031.87 a	12.92	0.016
Feed intake (gm)	1852.60	1882.76	1886.77	1847.99	1874.97	14.68	0.901
FCR (kg/kg)	2.02 a	1.84 b	1.84 b	1.80 b	1.81 b	0.021	0.002
Mortality %	2.56	2.72	2.22	1.83	1.78	0.34	0.897

^{a,b,c} Within the same row different letter mean significantly differ at ($P<0.05$).

T_1: (Control): basal diet (no feed additives), T_2: basal diet + 500g Optifeed/ton in starter feed + 100 g Oleobiotec /ton during all phases of feeding. T_3: basal diet + 500g Optifeed/ton in the starter feed +100 g Oleobiotec/ton in both grower and finisher feeds. T_4: basal diet + (500g Optifeed/ton in the starter feed + (250 g VéOPremium/ton in both grower and finisher feeds. T_5: basal diet + 500g Optifeed/ton in the starter feed + both 250 g VéOPremium/ton and 100 g Oleobiotec/ton in both grower and finisher feeds.

Broiler performance during total trial period 1-35 days

Table (5) shows the influence of various phode feed additives on the broiler performance during the total trial period. Overall, it had a significant effect on all traits except the mortality rate. In specific, best average body weight and weight gain were obtained in T4 compared to control. Considering feed intake and FCR, T4 had a highest significant influence compared with control. Regarding the mortality rate and although it was not significant, in T5 the death rate was lower than control in half. Results were in line with finding of (Al-Sagan *et al.*,2020; Ruff *et al*., (2021) who mentioned that adding phytogenic in broiler diet under heat stress condition significantly improved broiler performance compared to a normal diet.

Table (5): Effect of feed additives on broiler performance during trial period (1 – 35 days).

Treatments / Parameters	**T1**	**T2**	**T3**	**T4**	**T5**	**Sem**	***P* value**
Body weight (gm)	1510.20 c	1695.55 b	1751.67 ab	1790.83 a	1765.21 a	21.05	0.0001
Weight gain (gm)	1466.50 c	1651.22 b	1707.87 ab	1747.33 a	1721.22 a	19.33	0.001
Feed intake (gm)	2761.33 b	2849.75 ab	2916.82 a	2945.61 a	2946.56 a	45.56	0.003
FCR (kg/kg)	1.883 a	1.726 b	1.708 b	1.686 b	1.712 b	0.028	0.015
Mortality %	11.56 a	10.01 ab	8.94 ab	8.82 ab	5.63 b	0.58	0.018

[a,b,c] Within the same row different letter mean significantly differ at ($P<0.05$).

T_1: (Control): basal diet (no feed additives), T_2: basal diet + 500g Optifeed/ton in starter feed + 100 g Oleobiotec /ton during all phases of feeding. T_3: basal diet + 500g Optifeed/ton in the starter feed +100 g Oleobiotec/ton in both grower and finisher feeds. T_4: basal diet + (500g Optifeed/ton in the starter feed + (250 g VéOPremium/ton in both grower and finisher feeds. T_5: basal diet + 500g Optifeed/ton in the starter feed + both 250 g VéOPremium/ton and 100 g Oleobiotec/ton in both grower and finisher feeds.

Carcass traits

Carcass and internal organs results are shown in Table (6). Different feed additives had a significant effect on dressing percentage, however, it had no significant effect on the remained carcass traits and internal organs. The best dressing percentage, breast weight was in T2 compared with control. Regarding to internal organs different feed additives had no significant effect on internal organs and crop pH compared to control. Similar results obtained by Mustafa *et al.*, (2019) who found that adding optifeed and oleobiotic in broiler diet significantly ($P<0.05$) recorded a higher dressing percentage of broiler at 35 days of age compared with broiler fed basal diet. Furthermore, Abd El-Hady *et al.*, (2019) reported that using natural phytogenic in broiler diet had no significant effect on the internal organs, kidneys, gizzard and heart compared to control. Opposite result obtained by Abd El-Hady *et al.*, (2019) who mentioned that adding natural phytogenic in broiler diet had no significant effect on the dressing percentage

Table (6): Effect of different feed additives on carcass of broiler at 35 days.

Treatments / Parameters	T1	T2	T3	T4	T5	Sem	*P* value
Dressing %	71.23 b	73.94 a	73.10 a	72.73 a	72.66 a	0.22	0.002
Thigh weight (gm)	327.50	363.75	340.41	338.33	353.33	7.14	0.590
Breast weight (gm)	396.66	471.65	438.75	447.08	455.41	9.26	0.114
Back weight (gm)	251.66	275.10	282.50	256.66	263.75	6.30	0.525
Neck weight (gm)	87.50	98.55	92.08	99.56	98.67	2.73	0.062
Wing weight (gm)	127.50	121.55	128.75	120.58	118.33	2.34	0.057
Bursa weight (gm)	1.13	1,07	1.16	1.21	1.11	0.049	0.930
Spleen weight (gm)	1.56	2.16	2.17	2.05	1.71	0.089	0.105
Liver weight (gm)	49.49	51.28	47.12	48.85	50.74	1.23	0.849
Gizzard weight (gm)	29.51	29.45	30.73	31.06	28.44	0.94	0.415
Heart weight (gm)	7.62	8.20	7.79	8.37	8.01	0.20	0.758
Crop pH+	4.99	5.04	5.01	4.95	5.05	0.031	0.882

[a,b,c] Within the same row different letter mean significantly differ at ($P<0.05$).

T_1: (Control): basal diet (no feed additives), T_2: basal diet + 500g Optifeed/ton in starter feed + 100 g Oleobiotec /ton during all phases of feeding. T_3: basal diet + 500g Optifeed/ton in the starter feed +100 g Oleobiotec/ton in both grower and finisher feeds. T_4: basal diet + (500g Optifeed/ton in the starter feed + (250 g VéOPremium/ton in both grower and finisher feeds. T_5: basal diet + 500g Optifeed/ton in the starter feed + both 250 g VéOPremium/ton and 100 g Oleobiotec/ton in both grower and finisher feeds.

Economic Efficiency

Table (7) shows the economic efficiency of the trial. Although the cost of consumed feed was higher in all treatments compared to control, there was an improvement in FCR and this lead to lower the cost of feed consumed for a kilogram of live body weight, subsequently, this cause a better net profit per kilogram live body weight per birds. The revenue percentage was high in all treatments being 8.5%, 9.6%, 10.6%, and 8.5% for T2, T3, T4, and T5, respectively.

Table (7): Economic efficiency ($/bird/kg Live body weight) at 35-d.

Parameters / treatments	Price of kg of feed consumed ($)	FCR	Cost of feed consumed for kg live body weight ($)	Price of Kg of live body weight ($)	Net income /kg /bird ($)	Improvement of economic profit (%)
T1	0.599	1.883	1.127	2.11	0.983	
T2	0.604	1.726	1.042	2.11	1.068	8.5
T3	0.604	1.708	1.031	2.11	1.079	9.6
T4	0.606	1.686	1.021	2.11	1.089	10.6
T5	0.609	1.712	1.042	2.11	1.068	8.5

T_1: (Control): basal diet (no feed additives), T_2: basal diet + 500g Optifeed/ton in starter feed + 100 g Oleobiotec /ton during all phases of feeding. T_3: basal diet + 500g Optifeed/ton in the starter feed +100 g Oleobiotec/ton in both grower and finisher feeds. T_4: basal diet + (500g Optifeed/ton in the starter feed + (250 g VéOPremium/ton in both grower and finisher feeds. T_5: basal diet + 500g Optifeed/ton in the starter feed + both 250 g VéOPremium/ton and 100 g Oleobiotec/ton in both grower and finisher feeds.

CONCLUSIONS

It can be concluded that adding Optiffed, Oleobiotec and Veo premium at different programs in broiler diet could improve broiler performance at the grower, finisher, and dressing percentage whole period of trial, more net profit will obtain by using mentioned phytogenic.

تأثير الإضافة العلفية المختلفة من الـ Optifeed و Oleobiotic و Veo premium في الأداء الإنتاجي لفروج اللحم تحت ظروف الإجهاد الحراري في محافظة دهوك

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الخلاصة

أُجريت هذه الدراسة في جامعة دهوك ، كلية علوم الهندسة الزراعية ، قسم الإنتاج الحيواني. لتقدير تأثير البرامج المختلفة لإضافة مواد نباتية (phytogenic) (Optifeed و Oleobiotic و Veo premium) والتي هي مواد نباتية تغذوية لها القدرة على تحسين الأداء الإنتاجي لفروج اللحم، وذلك في مراحل تغذية فروج اللحم: البادئ، والنمو، والناهي، وطوال فترة التجربة بأكملها، وكذلك خصائص الذبيحة والكفاءة الاقتصادية عند عمر 35 يومًا. 1440 فرخاً بعمر يوم واحد وزعت في خمس مجموعات بواقع ستة مكررات لكل مجموعة (48 فرخاً/ مكرر). إضافة برامج غذائية مختلفة من Optifeed و Oleobiotec و Veo premium **إلى** النظام الغذائي لفروج اللحم. أدت إضافة المواد الغذائية النباتية إلى العليقة إلى تحسن معنوي (أ< 0,05) في أداء دجاج التسمين عند فترتي النمو والناهي وطوال فترة التجربة الكاملة (35) يومًا مقارنة بمجموعة السيطرة. فيما يتعلق بخصائص الذبيحة والأعضاء الداخلية، فقد زادت معنويا (أ< 0,05) في جميع المعاملات نسبة التصافي مقارنة بالنظام الغذائي العادي، بينما لم تتأثر جميع خصائص الذبيحة الأخرى والأعضاء الداخلية معنوياً بالإضافات النباتية التغذوية. أما فيما يتعلق بالكفاءة الاقتصادية، أدت جميع الإضافات النباتية التغذوية إلى تحسين الربح مقارنة بالنظام الغذائي الأساسي.

الكلمات الدالة: اضافات نباتية، فروج اللحم، الأداء الإنتاجي، خصائص الذبيحة.

REFERENCES

Abbas, T. E., & Ahmed, M. E. (2010). Effect of supplementation of Nigella sativa seeds to the broiler chicks diet on the performance and carcass quality. *International Journal of Agriculture sciences*, *2*(2), 9.(DOI:10.9735/0975-3710.2.2.9-13).

Abd El-Hady, A. M., El Ashry, G. M., & El-Ghalid, O. A. H. (2019). Effect of natural phytogenic extract herbs on physiological status and carcass traits of broiler chickens. *Open Journal of Animal Sciences*, *10*(1), 134-151. (DOI: 10.4236/ojas.2020.101007).

Alagawany, M., El-Saadony, M. T., Elnesr, S. S., Farahat, M., Attia, G., Madkour, M., & Reda, F. M. (2021). Use of lemongrass essential oil as a feed additive in quail's nutrition: its effect on growth, carcass, blood biochemistry, antioxidant and immunological indices, digestive enzymes and intestinal microbiota. *Poultry Science*, *100*(6), 101172. (DOI: 10.1016/j.psj.2021.101172).

Alcicek, A. H. M. E. T., Bozkurt, M., & Çabuk, M. (2003). The effect of an essential oil combination derived from selected herbs growing wild in Turkey on broiler performance. *South African Journal of Animal Science*, *33*(2), 89-94.(DOI: 10.4314/sajas.v33i2.3761).

Ali, A. F., Mohammed, T. T., & Al-Bandar, L. K. (2019). Effect of adding different levels of Optifeed®, Vêo® premium and Oleobiotec® to the diets as appetite stimulants in the production and physiological performance of male broiler under heat stress conditions. *Plant Archives*, *19*(1), 1491-1498.(http://www.plantarchives.org/PDF%2019-1/1491-1498%20(4858).pdf).

Ali, D., Ibrahim, I., & AL sardary, S. (2019). The effect of thermal manipulation of (ROSS 308) broiler breeder eggs during early and late emberyogenesis stages on performanceof hatchie chicks at heat stress condition. *Mesopotamia Journal of Agriculture*, *47*(2), 149-159. DOI: 10.33899/magrj.2019.163189).

Al-Sagan, A. A., Khalil, S., Hussein, E. O., & Attia, Y. A. (2020). Effects of fennel seed powder supplementation on growth performance, carcass characteristics, meat quality, and economic efficiency of broilers under thermoneutral and chronic heat stress conditions. *Animals*, *10*(2), 206.(DOI: 10.3390/ani10020206).

Duncan, D. B. (1955). Multiple range and multiple F tests. *Biometrics*, *11*(1), 1-42. https://www.jstor.org/stable/3001478).

FrAnKIČ, T., Voljč, M., Salobir, J., & Rezar, V. (2009). Use of herbs and spices and their extracts in animal nutrition. *Acta agriculturae slovenica*, *94*(2), 95-102 https://www.cabdirect.org/cabdirect/abstract/20103004378).

Hernandez, F., Madrid, J., Garcia, V., Orengo, J., & Megias, M. D. (2004). Influence of two plant extracts on broilers performance, digestibility, and digestive organ size. *Poultry science*, *83*(2), 169-174.(DOI: 10.1093/ps/83.2.169).

Janz, J. A. M., Morel, P. C. H., Wilkinson, B. H. P., & Purchas, R. W. (2007). Preliminary investigation of the effects of low-level dietary inclusion of fragrant essential oils and oleoresins on pig performance and pork quality. *Meat Science*, *75*(2), 350-355. (DOI: 10.1016/j.meatsci.2006.06.027).

Manan, A., Chand, N., Khan, S., Qureshi, M. S., Rehman, A. U., & Jan, B. (2012). Effect of periodic supplementation of herbal infusion on the liver function and lipid profile of broiler chickens. *Sarhad Journal Agriculture*, *28*(1), 76-82. https://n9.cl/c3ak5

Mustafa M. Ag., Sardary S. Y. T., Al-Rawi Medina A. A. (2019). Effects of Optifeed® and Oleobiotec® on Broiler Performance and Immunity. *International Journal of Advances in Science Engineering and Technology*,*4* (7): 2321 –9009 http://www.iraj.in/journal/journal_file/journal_pdf/6-600-159340767777-83.pdf).

Mustafa, M. A., & Mohammed, R. R. (2020).Impact of adding serotonin,tryptiphan and optifeed in drinking water on broiler behavior ,performances growth and some biochemical traits of blood .. *Mesopotamia Journal of Agriculture*, *48*(4), 112-122. DOI: 10.33899/magrj.2020.128894.1089).

Ruff, J., Tellez, G., Forga, A. J., Señas-Cuesta, R., Vuong, C. N., Greene, E. S., ... & Tellez-Isaias, G. (2021). Evaluation of three formulations of essential oils in broiler chickens under cyclic heat stress. *Animals*, *11*(4), 1084.(DOI: 10.3390/ani11041084).

Stevanović, Z. D., Bošnjak-Neumüller, J., Pajić-Lijaković, I., Raj, J., & Vasiljević, M. (2018). Essential oils as feed additives—future perspectives. *Molecules*, *23*(7), 1717. DOI:10.3390/molecules23071717).

Taha, K. M., Khdr, D. M., & Kareem, K. Y. (2021).Identification and differentiation of poultry meat and products using PCR -RFLP technique.. *Mesopotamia Journal of Agriculture*, *49*(1), 34-42.(DOI: 10.33899/magrj.2021.129251.1105).

Wali, A. F., Jabnoun, S., Razmpoor, M., Najeeb, F., Shalabi, H., & Akbar, I. (2022). Account of Some Important Edible Medicinal Plants and Their Socio-Economic Importance. In *Edible Plants in Health and Diseases* (pp. 325-367). Springer, Singapore.(DOI: 10.1007/978-981-16-4880-9_14).

Yitbarek, M. B. (2015). Phytogenics as feed additives in poultry production: a review. *International Journal of Extensive Research*, *3*, 49-60. https://n9.cl/lgbf8