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EFFECT OF USING OIL BY-PRODUCT (ACIDULATED SOAP STOCK AND DISTILLED FATTY ACIDS) ON PRODUCTIVE PERFORMANCE, EGG COMPONENTS AND QUALITY CHARACTERISTICS OF LAYING JAPANESE QUAIL

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SUMMARY

This research was carried out to determine the use of oil waste ((acidulated soap stock (AS) and distillated fatty acids (DFA)) as a replacement of various traditional oil sources (soybean oil (SO) or palm oil (PO)) in the diets of laying Japanese quail and their influences on productive performance, carcass traits, egg components and quality characteristics. At 16 weeks of age, 160 laying Japanese quail were distributed into four groups (40 quail each). Each group contained 4 replicates of 10 quail each. The first group was feed the basal diet containing (3%) SO as a fat source (control), while the groups T1-3 received basal diets with (3%) of (PO, T1), (AS, T2) and (DFA, T3) respectively. The experimental period was extended for 12 weeks.

The result obtained revealed that:

- Layer quail fed diets containing (DFA, T3) improved Productive performance (egg production rate %, feed conversion ratio (kg feed /kg egg) and egg mass comparable or better than other treatments T1-2 and control.
- Carcass traits indicated that oil wastes (AS and DFA) or traditional oil sources (SO and PO) hadn't effect on carcass characteristics (inedible and edible parts %)
- Similar trends were observed the effect of dietary treatment on egg quality (shell weight %, eggshell thickness (mm), shell weight unit of surface and shell density), on the other hand quail fed (DFA, T3) diet gave the lowest significant egg albumin weight% and shell surface area compare with other treatments.
- The different fat sources (SO, PO, AS and DFA) supplementation to the quail diets was effective on fatty acid composition of egg yolk.

Conclusion: It is observed that the best performance was seen when 3% DFA supplementation laying quail diet without negative effecting on carcass traits, egg components, and quality characteristics.

Keywords: *Laying quail, performance, egg quality and fatty acids.*

INTRODUCTION

In developing countries, imported vegetable oils are increasing as a component of the poultry industry under intensive production systems, which have led to an increase in their prices in the world market. However, most of vegetable oils are mainly used for human consumption and also for biodiesel production. In this regard interest is growing in using alternative oil sources in poultry diets rather than using crude oil sources, which would increase competition between food and feedstuff markets and bio fuel industry (Renewable Fuel Standard, 2013; Ravindran, 2010; Onuh, 2005 and Akinfala *et al.,* 2002).

Most of studies that added different sources of fats or oils in broiler diets revealed generally no significant effect on the productive performance traits, wheather the fats or oils were driven from animal, plant or industry by products (Ibrahim *et al.,* 2014; Sadeghi *et al.,* 2012; Hamady, 2012; Potença *et al.,* 2009; Kavouridou *et al.,* 2008; Ibrahin, 2005; Azman *et al.,* 2004 and Balevi and Coskun, 2000)

On the other hand, Lara *et al.,* (2003) found that birds fed diet with soybean oil recorded weight gain and feed intake better than the birds fed with acidulated soybean oil soap stock conversely, Ali *et al.,* (2014) found that the beast feed conversion values was showed for local chickens fed diets containing distillated fatty acid (DFA), while the worst was found with those fed the sunflower oil.

In laying hens (Whitehead *et al.*, 1993 and Whitehead, 1995) showed that dietary unsaturated fats Increase the weight of the egg by stimulating the constructing of oviductal proteins that is different from that causing the age related increase in egg weight. Pardio *et al.* (2005) concluded that egg weight, shell thickness and shape index weren't affected by different levels of soybean oil soapstock in laying hen diets. Additionally, consideration of 100% soybean soapstock as replacement for soybean oil permitted production of eggs with comparative PUFA / SFA and n-6 / n-3 ratios when compared with eggs from hens fed control.

This study was conducted to determine the effect of adding oil wastes (Acidulated soapstock and distillated fatty acids) as replacement of (soybean oil and palm oil) in the diets of laying Japanese quail on productive performance, egg components and quality characteristics.

MATERIALS AND METHODS

The experiment was carried out in Agriculture Experiments and Research Station, Shalakan, Poultry production experimental unit, Faculty of Agriculture, Ain shams University. Experimental design and protocol within this study were conducted according to ethical guidelines approved by the Experimental Animal Care and Research Ethics Committee of Ain Shams University, Agriculture Sector Committee (Approval No 5-2023-15).

Birds and housing:

One hundred and sixty (16 weeks old) layer quail were individually waited and randomly divided into four treatment groups. Each treatment consisted of 4 replicates of 10 birds per experimental unit. The birds were randomly allocated in individual pens in three tier latteries equipped with feeding hoppers and drinking nipples. The lighting program was (16L+8D) during the experimental period (12 weeks).

Data collection:

Body weight was recorded as initial weight (at 6 wks of age). Quails were fed ad-libtum and water was available at all time. Every week feed left was measured to determine feed consumption. The eggs from each replication were collected every day and weighted and egg mass was calculated for determination of feed conversion ratio. At the end of experiment 10 eggs from each replicate of each experimental treatment were used for determination of egg components and chemical composition, egg shell quality and fatty acids analysis. Egg shell quality where evaluated using the following parameters

- Shell thickness (ST) , expressed in millimeter using dial touch micrometers
- Shell surface area(SA) in cm2 using the following equation suggested by Nordstrom and Ousterhout (1982):

$$SA\ (cm2) = 3.9782 \times EW^{0.7056}$$

Where 3.9782 = constant factor, EW = fresh egg weight

- Shell weight per unit surface area (SWUSA) using the following equation suggested by Nordstrom and Ousterhout (1982):

$$SWUSA\ (mg/cm) = SW\ (mg) / SA\ (cm^2)$$

- Shell density (SD) im g/cm^2 was estimated for each egg using the following equation suggested by Curits *et al.* (1985):

$$SD = SW\ (g) / SA\ (cm^2) \times ST\ (cm).$$

Routine chemical analysis (Moisture, Protein, Ether extract and Ash%) for inner eggs components was determined according to AOAC (2012)

Fatty acids analysis:

Fatty acids profile of fat and oils in tested materials and quails eggs were transesterified into their corresponding FAMES using methanoleic NaOH and Boron triflouride (BF3) with methanol described by AOAC (2012**)**

Experimental diets:

Four experimental diets were formulated to provide similar nutrients content according the layer quail nutrients requirements suggested by NRC (1994), except energy levels and fatty acids profile (Table1). These diets consisted of four dietary fat sources (soybean oil (SO, control), palm oil (PO, T1), acidulated soapstock (AS,T2) and distillated fatty acids (DFA,T3). The experimental diets in mash form were based on corn, soybean meal and corn gluten meal.

Table (1): Composition and calculated analysis of the experimental diets.

Ingredients%	**Control**	**T1**	**T2**	**T3**
Yellow corn	55.04	55.04	55.04	55.04
Soybean meal (44 % CP)	31.00	31.00	31.00	31.00
Corn gluten meal(60%CP)	2.80	2.80	2.80	2.80
Soybean Oil	3.00	0.00	0.00	0.00
Palm oil	0.00	3.00	0.00	0.00
Acidulated soapstock fatty acid	0.00	0.00	3.00	0.00
Distillated fatty acid	0.00	0.00	0.00	3.00
DI calcium phosphate	2.13	2.13	2.13	2.13
Limestone	5.10	5.10	5.10	5.10
Lysine HCL	0.11	0.11	0.11	0.11
DL- Methionine	0.22	0.22	0.22	0.22
Salt (NaCL)	0.30	0.30	0.30	0.30
Vit. & min.Premix*	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00
Calculated analysis**				
CP %	20.05	20.05	20.05	20.05
ME (Kcal/Kg)	2904.1	2826.8	2841.1	2903.3
Calcium %	2.55	2.54	2.54	2.55
Available phosphorous %	0.62	0.62	0.62	0.62
Lysine%	1.31	1.26	1.26	1.31
Methionine %	0.70	0.71	0.71	0.70
Meth. + Cys. %	0.90	0.92	0.92	0.90
Palmitic acid (C16:0)	0.77	1.73	0.61	0.93
Stearic acid (C18:0)	0.18	0.21	0.17	0.12
Oleic acid (C18:1 n-9)	1.41	1.91	1.42	0.91
Linoleic acid (C18:2n-6)	2.80	1.47	1.95	2.12
Linolenic acid (C18:3n-3)	0.23	0.08	0.07	0.93
Saturated fatty acids (SFA)	0.45	1.46	0.29	0.55
Monounsaturated fatty acids (MUFA)	0.71	1.21	0.71	0.20
Polyunsaturated fatty acids (PUFA)	1.79	0.30	0.77	1.80
Total unsaturated fatty acids (TUSFA)	2.49	1.50	1.48	2.00
PUFA/SFA	0.12	0.01	0.08	0.10
USFA/SFA	0.17	0.03	0.15	0.11
MUSFA/PUSFA	0.01	0.13	0.03	0.00

Treatments T1, T2, T3 and T4 contained 3% soybean oil, palm oil, acidulated soapstock fatty acid and distillated fatty acids, respectively.

** Composition of vitamin and minerals premix. Each 3 kg. of premix includes: 15000000 I.U. VIT. A, 3000000I.U. VIT. D3, 50000 mg. VIT. E, 3000 mg. VIT. K3, 3000 mg. VIT. B1, 8000 mg. VIT. B2, 4000 mg. VIT. B6, 20 mg. VIT. B12, 15000 mg Pantothenic acid, 60000 mg. Niacin acid, 1500 mg. Folic acid, 200 mg. Biotin, 200000 mg VIT C, 80000mg. Mn, 80 mg. Zn, 60000 mg. Iron, 10000 mg. Cu, 1000 mg. Iodine , 200 mg. Se 100 mg, cobalt 100 mg, carrier (CaCo3) add to 3 Kg.*

*** Calculated analysis of the experimental diets was done according to (NRC, 1994). And fatty acids composition of the four and dietary fat sources.*

Carcass traits:

At the end of experiment four birds of each treatment representing the average group weight were slaughtered; allowed to bled, defeathered eviscerated and internal organs were separated and the carcass weight, liver gizzard, heart, blood, feather, ovary, oviduct, spleen, and visceral were immediately excised, weighted and recorded

Statistical analysis:

Data were statistically analyzed using the general liner model procedure of analysis (SAS, 2004). Duncan's multiple range test (Duncan, 1955), was used to test differences within means of treatment, while level of significance was set typically at minimum ($P \leq 0.5$). the statistical model used for analyzing data was as following:

$$Yij = u + Ti + Eij$$

Where Yij = mdiidual observation; u = overall mean; Ti= effect of treatment; Eij= random error.

RESULT AND DISCUSION

Effect of dietary treatments on productive performance of layer quails:

The effect of feeding oil wastes on productive performance on layer quails can be shown as follows:

Egg production, egg weight and egg mass:

Productive performance of quail as affected by dietary treatments is illustrated in table (2). Data in table showed that there were significant differences between treatments in egg production, egg weight and egg mass among treatments during the studied period (12 wks). Quail fed distillated fatty acids (T3) reflected the highest egg production and egg mass compare with other treatments. However, egg production increase by 21.5% (68.80 vs. 56.61) compare with that fed control diet and egg mass showed similar trend (8.10 vs. 6.59). In addition, the differences were significant between the two treatments.

Table (2): Effect of dietary treatments on productive performance of laying quail.

Items	Treatments				SEM	Sig.
	Control	T_1	T_2	T_3		
Initial weight ,g	249.80	257.47	254.80	241.81	2.63	NS
Egg production rate %	56.61^{ab}	49.96^{b}	59.62^{ab}	68.80^{a}	2.98	*
Egg weight, g	11.58^{b}	14.08^{a}	12.37^{b}	11.83^{b}	0.27	*
Egg mass	6.59^{b}	7.20^{ab}	7.39^{ab}	8.10^{a}	0.33	*
Feed consumption bird, g	27.14	26.39	26.54	28.87	0.50	NS
Feed conversion ratio	4.24^{a}	3.80^{b}	3.72^{b}	3.66^{b}	0.21	*

a,b and c mean in same raw with different superscript are significant (P≤0.05) different. NS non-significant
Control: with oil soybean oil, T1: palm oil, T2: Acidulated oil soap stock, T3: distillated fatty acids

Moreover, feeding diet containing palm oil (T1) gave the lowest egg production (49.96%) and highest egg weight (14.08g) compare with other treatments and corresponding value were 11.58, 12.37 and 11.83g when birds were fed diets containing soybean oil (control), acidulated oil soapstock (T2) or distillated fatty acids (T3), respectively. In addition, there were significant differences between treatments. These finding are in contrast with the results obtained by Hamady *et al.* (2012) in Japanese quail, Ceylan *et al.,* (2011) in layer hens, Smink *et al.* (2010) in broiler chicks and Ibrahim (2005) in silver Montazah chicks. They concluded that no significant differences were observed among different fat and oil sources on productive performance of birds. On the other hand, similar observed were reported by other investigators, Lara *et al.* (2003), Attia *et al.* (2006) Corduk and Sarica (2008) and Ayed *et al.* (2015). They showed that inclusion different sources of fat in poultry diets had significantly effect on final productive performance.

Feed consumption and feed conversion ratio:

Data in table (2) indicated that daily feed consumption per quail (g/d) increase by feeding distillated fatty acids compare with other treatments. The corresponding figures were 28.87 vs. 27.14, 26.39 and 26.54 (g/d) respectively, without significant differences between treatments. This different in feed consumption may be related to that birds can meet their requirements of energy by increasing their consumption of feed According to Leeson and Summers (1991). Feed conversion ratio showed that birds fed control diet (soybean oil) were less efficient in converting their food into egg compared with those fed other dietary treatments (T1-3). The corresponding figures were 4.24 vs. 3.80, 3.72 and 3.66 respectively with significant differences among dietary treatments. Birds fed diets with distillated fatty acids (T3) or acidulated oils soapstock (T2) recorded FCR better than those fed control diet (soybean oil) or (palm oil, T1), which could be due to the lowest egg production, egg weight, and egg mass (Table 2). Effect of oil types and fat concentration on production performance, egg quality and antioxidant copay of layer hens. Gao *et al.* (2021) showed that production performance and egg quality affected significantly by the type and quantities of oils and fats in the laying hens diets.

Carcass characteristics:

Table (3) showed the effect of different dietary treatments on carcass characteristics% of quail at the end of experiment. Experimental treatments with different fat sources (T1-3) hadn't significant effects on studied parameters compared with control. The conforming values for total edible parts (carcass + giblets) percentages ranged between 65.01 and 68.05% while carcass percentage ranged between 60.32 and 63.01%. On the other hand, the birds fed acidulated oil soapstock (T2) gave the highest figures of 63.01 and 68.05% for carcass and total edible parts%.

Table (3): Effect of dietary treatments on carcass characteristics % of laying quail.

Items%	Treatments				SEM	Sig.
	Control	T_1	T_2	T_3		
Blood	4.94	4.83	5.13	3.45	0.25	NS
Feather	1.83	3.96	4.31	3.77	0.45	NS
Ovary	1.44	1.74	0.93	1.57	0.17	NS
Oviduct	2.77	4.27	2.09	2.77	0.36	NS
Spleen	0.06	0.07	0.08	0.06	0.00	NS
Visceral	27.24	23.21	22.51	25.81	0.83	NS
Total inedible parts	34.04	31.99	31.95	33.07	0.76	NS
Carcass	60.32	62.59	63.01	61.85	0.76	NS
Gizzard	2.17	1.86	1.67	1.72	0.08	NS
Liver	2.72	2.77	2.72	2.71	0.09	NS
Heart	0.74	0.78	0.66	0.66	0.03	NS
Giblets	5.64	5.42	5.04	5.08	0.15	NS
Total edible parts	65.01	68.01	68.05	66.93	0.80	NS

a,b and c mean in same raw with different superscript are significant (P≤0.05) different. NS non-significant
Control: with oil soybean oil, T1: palm oil, T2: Acidulated oil soap stock, T3: distillated fatty acids

In the same order, the figures of total inedible parts% (blood+ feather +ovary + oviduct +spleen + visceral) percentages indicated insignificant different between birds fed diets containing different fat sources (T1-3) compare with control. The conforming values for total inedible parts% ranged between 31.95 and 34.04%. Quails fed control diet (soybean oil) showed the highest percentage of total inedible parts, while birds fed acidulated oil soapstock (T2) had the lowest figures, however, the differences failed to be significant. Similar observation was found by other investigators, Abdulla *et al.* (2016), Das *et al.* (2014); and Ibrahim *et al.* (2014). They concluded that adding different sources of fats or oils to broiler diets had no effects on carcass yield. These findings are disagree with what observed by El-Qub and Abo Omar (2016) in broiler chicken; Nematallah *et al.* (2013) in growing local chicks and Shimaa A. Mousa *et al.* (2017) in growing quails they concluded that carcass percentages and total edible parts percentages significantly affected when birds fed different fat or oil sources.

Egg components, shell quality and chemical composition of quail eggs:

The results in table (4) show the effect of different dietary treatment on egg components, shell quality and chemical composition of quail eggs. The percentages of egg yolk and egg albumin in relation to egg weight for quail fed distillated fatty acids (T3) reflected significant different than those fed other dietary treatments. Albumin% ranged between 58.86 and 54.59% and quail fed control diet gave the highest figure while, birds fed (T3) diet had the lowest figure and the differences were significant.

Contrary to that the values of yolk percentages ranged between 35.28% (T3) and 31.89% (control) and the differences were significant.

Treatments had insignificant effect upon most of egg shell quality traits included in the study as shown in table (4). However, shell surface area (cm2) ranged between 20.96 and 23.45 cm2 and quails fed diet containing distillated fatty acids (T3) gave the lowest figures while, birds fed palm oil (T1) gave the highest figures and the differences between different treatments were significant. While, shell thickness (mm), shell weight per unit of surface area (mg/cm2) and shell density (g/ cm2) were almost the same when quails fed different treatments. The best figures of egg shell quality were seen when acidulated soapstock (T2) was incorporated in diet and the corresponding values were 0.33 (mm), 0.056 (mg/ cm2) and 0.019 (g/ cm2) for ST, SWUA and SD respectively but the differences among treatments failed to be significant.

Table (4): Effect of dietary treatments on egg quality of laying quail.

Items	Treatments				SEM	Sig.
	Control	**T_1**	**T_2**	**T_3**		
Egg shell weight %	9.25	9.07	10.97	10.13	0.26	NS
Egg albumin weight %	58.86^{a}	57.95^{a}	56.69^{ab}	54.59^{b}	0.41	*
Egg yolk weight %	31.89^{b}	32.98^{b}	32.34^{b}	35.28^{a}	0.38	*
Egg shell thickness (cm)	0.33	0.31	0.33	0.29	0.01	NS
SA (cm^2)	21.93^{ab}	23.45^{a}	22.07^{a}	20.96^{b}	0.20	*
SWUSA (mg/cm)	0.047	0.048	0.056	0.051	0.01	NS
SD (g/cm^2)	0.016	0.015	0.019	0.016	0.01	NS
Inner egg components (Yolk + Albumin)						
Moisture%	73.82	73.70	73.80	73.33	0.47	NS
Ash %	1.26	1.45	1.46	1.64	0.14	NS
Ether Extract %	10.97^{a}	9.79^{b}	8.83^{c}	9.75^{b}	0.28	**
Crud protein %	13.96^{b}	15.07^{a}	15.92^{a}	15.29^{a}	1.89	**
Egg yolk components						
Moisture%	37.15^{b}	29.30^{d}	38.42^{a}	36.35^{b}	0.61	**
Ash %	5.07^{b}	7.19^{a}	5.19^{b}	6.91^{a}	0.68	**
Ether Extract %	36.03^{ab}	38.36^{a}	34.19^{b}	33.06^{b}	1.30	**
Crud protein %	21.48^{b}	25.14^{a}	23.64^{ab}	$23.^{67ab}$	1.03	**

a,b and c mean in same raw with different superscript are significant (P≤0.05) different. NS non-significant
Control: with oil soybean oil, T1: palm oil, T2: Acidulated oil soap stock, T3: distillated fatty acids
SA: shell surface area, SWUSA: shell weight per unit surface area, SD: shell density.

Chemical composition (Moisture and ash %) of inner egg components (yolk and albumen without shell) were almost the same when quails fed different dietary treatments. Ether extract percentage for quails fed control diet showed the higher significant figure compare with that fed other dietary treatments (10.97 vs. 9.97, 8.83 and 9.75%) respectively. Contrary to that the values of crude protein percentage of egg (without egg shell) ranged between 13.96% (control) and 15.07 (T1), 15,92 (T2) and 15.29% (T3), respective when different fat sources were incorporated in diets and differences were significant. These results partially similar to those reported by (Gorbas *et al.,* 2001; Bozkurt *et al.,* 2012; and Bertipaglia *et al.,* 2016) they concluded that the using different fat sources in laying quail diets hasn't affected egg quality.

The effect of diets containing different fat sources in laying quail diets on fatty acids content of egg yolk is present in Table (5). The soya oil control group (MUFA) content was than the other (T1) treatments (T1-3). However, the highest content of oleic acid was recorded by birds fed diet with palm oil and the group with the highest content of linoleic acid, linoleic acid and PUFA fatty acids was soya oil (control group). The results of current study reported that different dietary fat sources addition altered the fatty acids profile of egg yolk in quails. It has been reported that egg yolk fatty acids can be changed as desired by adding different sources of oil to laying hen diets (Van E Lswylk, 1997; Milinsk *et al.,* 2003; and Cachaldora *et al.,* 2006)

CONCLUSION

It is observed that, the best performance was seen when 3% DFA supplementation laying quail diet without negative effecting on carcass traits, egg components, and quality characteristics.

Table (5): Effect of dietary treatments on Fatty acids profile of Egg yolk fatty acid composition of different fat sources (as % of total fatty acid).

Name of fatty acid	Shorthand	SO	PO	AS	DFA
Myristic acid	C 14:0	0.41	0.45	0.39	0.47
Palmitic acid	C 16:0	26.31	27.88	26.63	27.66
Margeric acid	C 17:0	0.25	0.16	0.19	0.17
Stearic acid	C 18:0	9.69	8.72	9.46	9.28
Palmitoleic acid	C 16:1 n-7	4.09	5.17	4.07	4.87
Oleic acid	C 18:1 n-9	36.78	43.82	40.39	41.11
Gondoic acid	C 20:1n-9	0.12	0.12	0.10	0.16
Linoleic acid	C 18:2 n-6	17.8	10.14	14.99	12.49
Linolenic acid	C 18:3 n-3	0.59	0.17	0.42	0.42
Gamma Linoienic acid	C 18:3-6	0.28	0.18	0.19	0.21
Eicosatrienoic acid	C 20:3n-6	0.12	0.13	0.11	0.11
Arachidonic acid	C 20:4 n-6	1.61	1.63	1.48	1.48
Docosatetraenoic acid	C 22:5n-6	0.13	0.27	0.1	0.23
Docosahexaenoic acid (DHA)	C 22:6n-3	0.48	0.27	0.51	0.31
Total Fatty acids (TFA)		**98.66**	**99.11**	**99.03**	**98.97**
Saturated fatty acids (SFA)		36.66	37.21	36.67	37.58
Monounsaturated fatty acids (MUFA)		40.99	49.11	44.56	46.14
Polyunsaturated fatty acids (PUFA)		21.01	12.79	17.8	15.25
Total unsaturated fatty acids (TUSFA)		62	61.9	62.36	61.39
PUFA/SFA		0.57	0.34	0.49	0.41
USFA/SFA		1.69	1.66	1.70	1.63
MUSFA/PUSFA		1.95	3.84	2.50	3.03
Σ n-3		1.07	0.44	0.93	0.73
Σ n-6		19.94	12.35	16.87	14.52
Σ n-6/ Σ n-3		18.64	28.07	18.14	19.89

Soybean oil (SO), palm oil (PO), Acidulated oil soap stock (AS): distillated fatty acids (DFA), USFA: unsaturated fatty acids, PUFA: Poly unsaturated fatty acids, MUSFA/PUSFA: Multi MUSFA/PUSFA, Σ n-: Omega 3, Σ n-6: Omega 6

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تاثير استخدام المنتجات الثانوية للزيوت (احماض دهنية واحماض دهنية مقطرة) على الاداء الانتاجى ومكونات وجودة البيض للسمان اليابانى البياض

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اجريت هذه التجربة لدراسة امكانية استخدام مخلفات الزيوت (احماض دهنية واحماض دهنية مقطرة) كبديل للزيوت التقليدية (زيت الفول الصويا وزيت النخيل) فى علائق السمان اليابانى البياض وتاثيرها على الاداء الانتاجى ومواصفات الذبيحة ومكونات وجودة البيض.
استخدمت فى هذه الدراسة عدد 160 سمانة بياضة عمر 16 اسبوع ووزعت عشوائيا على 4 مجاميع تجريبية كل مجموعة قسمت الى 4 مكررات (10 طيور لكل مكرر). المجموعة الاولى (الكنترول) غذيت على عليقة قاعدية (3% زيت فول صويا) بينما المجاميع الاخرى من 1-3 اعطيت العليقة القاعدية مع 3% زيت نخيل (T1) او 3% احماض دهنية (T2) او 3% احماض دهنية مقطرة (T3). وكانت النتائج كالتالى

1. السمان البياض المغذى على 3% احماض دهنية مقطرة (T3) حسنت الاداء الانتاجى [(%انتاج البيض وكتلة البيض وكفاءة التحويل الغذائى (كجم غذاء / كجم بيض)] مقارنتا بعليقة الكنترول او المعاملات الغذائية الاخرى.
2. صفات ذبيحة السمان لم تتاثر باستخدام مصادر الدهون المختلفة سواء مخلفات الزيوت (احماض دهنية واحماض دهنية مقطرة) او الزيوت التقليدية (زيت صويا وزيت نخيل)
3. صفات البيض (% للقشرة وسمك القشرة ووزن القشرة لوحدة المساحة وكثافة القشرة) لم تتاثر بمصادر الدهون المختلفة بينما سجلت المجموعة المغذاه على الاحماض الدهنية المقطرة T3 اقل %لبياض البيض ومساحة قشرة البيض بالمقارنة بالمعاملات الاخري.
4. استخدام المصادر المختلفة للدهون يوثر على محتوى صفار البيض من الاحماض الدهنية

توصى نتائج هذه الدراسة باستخدام الاحماض الدهنية المقطرة بمعدل 3% فى علائق السمان البياض لتحسين الاداء الانتاجى بدون ادنى تاثير سلبى على مكونات البيضة وجودة البيض وصفات الذبيحة.