*J. Animal and Poultry Prod., Mansoura Univ., Vol.6 (2):85 - 97, 2015*

# THE EFFECT OF OMEGA -3 ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF SHEEP
## 1- EWES AND EWE LAMBS

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## ABESTRACT

Total of 75 mature healthy (1/2 Finnish Landrace × 1/2 Rahmani ewes) at 3-6 years of age and weighing approximately 45.21 kg were divided into three similar groups (control, $G_2$ and $G_3$). The first group was fed the control diet ($G_1$). While, fish oil was added to the control diet at level of 1.5 and 3% of total DM intake for $G_2$ and $G_3$, respectively (first trail).While, in the second trail, 24 female lambs at 3 months of age with an average live body weight of 14.5±0.6 kg were randomly divided into three groups (8 lambs each). The first group was fed a basal diet, while $G_2$ and $G_3$ treated with fish oil at 1.5 and 3% of total DM intake, respectively.

The results of this study indicated that the live body weight of ewes was not affected significantly by dietary treatments during pregnancy period and after lambing. Percentage of ewes exhibited estrus was higher in $G_2$ (68%) than in $G_1$ and $G_3$ (44 and 48%, $P<0.05$), respectively. Fertility rate was 77.7, 70.5 and 100% in control, $G_2$ and $G_3$, ($P<0.05$). Litter size tended to gradually increase with increasing fish oil level. The results indicated that added fish oil ($G_2$ and $G_3$) led to increase total milk yield by about 45.2 % and 38.1 % than the control group but the differences were not significant.

Age at puberty in ewe lambs was 318.1, 273 and 290.3 days for control, $G_2$ and $G_3$, respectively ($P<0.05$). Average daily gain of ewe lambs was the highest level ($P<0.05$) in $G_3$ (103.7 g) followed by $G_2$ (98.15 g), while $G_1$ had the lowest value (70.74 g). The lowest feed cost/kg gain was recorded in $G_2$ and $G_3$ (19.86 and 19.49 LE, respectively), while the highest feed cost/kg gain was recorded in $G_1$ (23.72 LE). On the light of the foregoing results, fish oil addition at rate of 1.5 and 3% to mature ewes and growing lambs had beneficial effects on productive and reproductive performance.

## INTRODUCTION

Nutrition is a key factor in controlling the process of oocyte and spermatozoa development, ovulation, the concentration of the hormones, fertilization and other factors through its direct or indirect actions (Wathes et al., 2007). There are evidences that the dietary supplementation with omega-3 fatty acids affects reproduction of different animal species (Rocke et al., 2001 and Zaniboni et al., 2006). Gulliver et al. (2012) reported that there is a strong evidence linking consumption of diets high in n-3 supplementation with longer time to estrus and parturition in associated with reduced $PGF_2\alpha$. The effects of omega-3 on other measurable outcomes of reproductive success, such as pregnancy rate, embryo survival and intergenerational effects on the health and production of offspring are largely unknown.

Improvement in fertility a part from improved energy status, Williams and Charles, (2003) suggested that fat supplementation mediates its positive

effect through other physiological mechanism such as progesterone concentrations in plasma are enhanced by fat supplementation and may enhance embryo survival. Certain polyunsaturated fatty acids such as linoleic acid and eicosapentanoic acids may reduce uterine secretion of prostaglandin.

The main objective of this study was to investigate the influence of fish oil on some productive and reproductive performance of mature ewes and their growing lambs.

## MATERIALS AND METHODS

This study was conducted at Sakha Experimental Station, Animal Production Research Institute, Ministry of Agriculture, in cooperation with the Department of Animal Production, Faculty of Agriculture, Kafrelsheikh University, Egypt. The experimental work was conducted during the period from March, 2013 to October, 2014.

**Experiment 1:**

Seventy five crossbred 1/2 Finnish Landrace × 1/2 Rahmani ewes at 3-6 years of age and an average live body weight of 45±2.1kg were randomly divided into three groups. The experimental period lasted from March and included 3 intervals, mating, pregnancy and suckling.

Ewes in the first group ($G_1$) were fed the control ration without any addition, which was formulated to meet the requirement of ewes (NRC, 1985). The fish oil was added and distributed on the concentrate feed mixture at levels of 1.5 and 3% of DM intake for $G_2$ and $G_3$, respectively. The amounts of concentrate fed mixture were adjusted according to the changes in the physiological and production stages.

All animals were kept under similar management conditions in a semi-open shaded yard during the experimental period. Fresh water was available all times.

At mating, ewes were monitored for sign of estrus using well trained ram two times per day (at 8.0 a.m. and 5.0 p.m.) for 30 days to determine reproductive performance. The changes in live body weight of ewes was recorded during the experimental period.

**Milk production:**

Milk yield was estimated biweekly for 8 weeks after lambing using milk suckling technique. Lambs were isolated from their mothers during previous night to record body weight before suckling at the morning (7.0 a.m.) and left them suckling from their mothers for 30 minutes, and then body weight was recorded again. The residual milk was hand milked and recorded. Similar procedure was repeating at the evening suckling at 5.30 p.m. The differences in the weight of lambs before and after suckling (at the two suckling) were added to give daily intake of suckling lambs. Milk intake plus milk removed by hand milking represented daily milk yield for that biweekly.

**Experiment II:**

After weaning (at 3 months of age), 24 ewe lambs with an average live body weight of 14.5±0.6 kg were randomly divided into three groups (8 lambs each).

Ewe lambs were fed separately in group feeding. The first group was fed a basal diet consisting of concentrate fed mixture (CFM) plus berseem hay, while in $G_2$ and $G_3$, fish oil was added to the basal diet at the rate of 1.5 and 3% of total DM intake, respectively. All animals were weighed biweekly till end of the experimental, than daily gain was calculated. Feed intake was adjusted every two weeks according to the changes in animal body weight status according to NRC (1985). Fresh water was available for animals free chose all the day round.

Attainment of puberty in ewe lambs:

At 5 months of age, teaser rams were introduced to the ewe lambs to detect the first estrus activity. The teaser rams were introduced three times daily 6 a.m., 12 a.m., 6 p.m. of each group for 20 minutes. The onset of first estrus was used as an indicator for the onset of puberty.

Age and live body weight at first estrus was estimated as age and live body weight at puberty.

**Feed conversion and economic efficiency:**

Feed conversion was calculated as the ratio between DM intake and weight gain. The economic efficiency was calculated as the ratio between price of weight gain and cost of feeding.

Statistical analysis:

Data obtained in this study were subjected to statistical analysis using General Linear Models Procedures (GLMP) adapted by SPSS for windows (2010) for user's guide. Duncan (1955) Multiple range test of SPSS programmer was done to determine the degree of significance among means at $P<0.05$. Chi-square was used to test the differences in conception rate among treatment group.

## RESTLTS AND DISCUSSION

Effect of fish oil addition on the live body weight of ewes at different physiological stages:

Data of the live body weight changes at different physiological stages of ewes fed fish oil addition are presented in Table (1).

**Table (1): Live body weight (kg) of ewes at different physiological stages as affected by the experimental diets.**

| Physiological stage | Experimental groups | | |
|---|---|---|---|
| | Control | Group 2 | Group 3 |
| Mating period | 45.5±2.6 | 46.9±1.4 | 45.2±0.9 |
| Late pregnancy: | | | |
| 45 days- prepartum | 46.6±1.7 | 50.8±2.0 | 47.2±1.2 |
| 30 days- prepartum | 47.1±1.3 | 52.4±1.6 | 49.0±1.7 |
| 15 days- prepartum | 48.1±2.5 | 53.7±1.8 | 50.0±1.85 |
| At lambing | 43.8±1.8 | 45.2±1.4 | 44.9±1.5 |
| After- Lambing (Suckling period): | | | |
| 30 days- postpartum | 41.7±2.6 | 44.1±1.5 | 44.2±1.4 |
| 60 days- postpartum (after weaning) | 40.2±3.3 | 40.2±3.3 | 43.8±1.1 |

Average live body weight of ewes gradually increased with the progress of pregnancy from 45.5; 46.9 and 45.2 kg at mating to 48.1; 53.7 and 50.1 kg at 15 days pre-partum in $G_1$, $G_2$ and $G_3$, respectively. These changes in live weight reflect the rapid growth of the fetus and its attachments during the last 4 weeks of pregnancy as well as the improvement of feed utilization during this period of pregnancy with supplementation of fish oil. Similar results were reported by Clary et al. (1993); Marinova et al. (2005) and El-Badawy (2008), who found that addition of fish oil increased average daily gain of sheep. Moreover, the reason for high body weight and its changes in this study might be due to increasing the energy status of the animal or by other processes independent of energy intake (Grummer and Carroll, 1991).

Accordingly in the present study, body weight changes were sharply decreased by 11.65; 13.64 and 3.10% for control, $G_2$ and $G_3$, respectively at lambing when compared with the live body weight at the end of suckling period. Similar results on the negative relationship between production and body weight changes were reported by Zambon et al. (2003) and Mandiki et al. (2002), who revealed a 16.42 to 20.72 % as rate of decrease in body weight of ewe after lambing. So, the sharp decrease in body weight results from lambing and removal of fetus and its attachments or that decrease may be related to the stress of lactation and milk production.

**Effect of fish oil addition on ewe's reproductive performance:**

Results of ewe reproductive performance as affected by the experimental diets are presented in Table (2). It was found that ewes fed 1.5% of fish oil ($G_2$) had higher percentage of exhibited estrus (68%) followed by those received 3% fish oil (48%) while the lowest value recorded in $G_1$ (44%). These results are in agreement with those obtained by Scott et al. (1995) and Williams and Charles (2003).

**Table (2): Reproductive performance of ewes in mating season (May) as affected by the experimental diets.**

| Item | Experimental group | | |
|---|---|---|---|
| | Control | Group 2 | Group 3 |
| No. of ewe | 25 | 25 | 25 |
| Body weight at mating (kg) | 44.5 | 47.9 | 45.2 |
| No. of ewes exhibited estrus | 11 | 17 | 12 |
| Ewes exhibited estrus (%)(1) | 44[b] | 68[a] | 48[b] |
| No. of ewes lambed | 8 | 12 | 12 |
| Fertility as (%) from mated ewes | 73[b] | 71[b] | 100[a] |
| Fertility as (%) from total ewes | 36 | 48 | 48 |
| No. of lambs born live | 9 | 14 | 17 |
| Litter size | 1.12 | 1.17 | 1.42 |

**No: total number of ewes in each group.**

**a and b Means denoted within the same row with different superscripts are significantly different at (P<0.05).**

**(1) Chi-square test**

Moreover, the results of this study showed that the fertility rate was about 73, 71 and 100% (as percent of ewes mated) and about 36, 48 and 48% (as percent of ewes subjected to mating) in control, $G_2$ and $G_3$, respectively. These results may indicated that the fish oil addition had a

positive effect on fertility of ewes which may be attributed to an improvement of negative energy states, leading to an earlier return to estrus postpartum (Mattos et al., 2000) or to an increase in progesterone production/secretion favorable to improved fertility and to a stimulation or inhibition of $PGF_2\alpha$ production/release which influence the persistence of the cropus Luteaum (Staples et al., 1998; Mattos et al., 2000 and Yoel-Zeron et al., 2002).

The number of lambs born live and litter size of ewes fed the diet in group 3 (17) was greater than in $G_1$ (9) and $G_2$ (14), but there were no significant differences between all groups. Similar results were reported by Lucy et al. (1992), Thatcher et al. (1996) and Yoel-Zeron et al. (2002), who found that ewes fed a diet supplemented with fish oil improved reproductive performance through increasing number of follicles and oocytes in the ovaries of ewes supplemented with polyunsaturated fatty acids more than in control ewes.

**Effect of fish oil addition on milk production during the suckling period:**

Average daily milk yield of ewes in different experimental groups during the suckling period is presented in Table (3).

**Table (3): Effect of feeding the experimental diets on milk yield (kg) of ewes during the suckling period.**

| Period (week) | Experimental groups | | | Overall mean |
|---|---|---|---|---|
| | Control | Group2 | Group3 | |
| 2 | 0.218±0.06 | 0.316±0.03 | 0.323±0.07 | 0.285±0.03 |
| 4 | 0.200±0.02 | 0.358±0.06 | 0.326±0.05 | 0.309±0.03 |
| 6 | 0.194±0.05 | 0.421±0.04 | 0.308±0.06 | 0.330±0.03 |
| 8 | 0.190±0.03 | 0.372±0.06 | 0.335±0.02 | 0.299±0.034 |
| Overall mean | 0.200±0.04 | 0.366±0.05 | 0.323±0.05 | |

Results showed that overall mean of daily milk yield of ewes during the suckling period was 0.200, 0.366 and 0.323 kg in three treated groups, respectively, but the differences among groups were statistically insignificant ($P \geq 0.05$).

These results are supported by Cardellino and Benson, (2002), who found that dietary fish oil supplementation had no effect on milk yield of ewes.

Generally, milk yield of dairy ewes was affected by number of suckling lambs during pregnancy or lactation (Treacher, 1978), type of birth, single, twins or triplets (Snowder and Glimp, 1991), lambing season (Hamdon, 2005) or lactation period length (Morsy, 2002).

Most studies showed 30 to 50 % increase in milk production of ewes over milk production of single suckling ewes. A further slight increase was observed in ewes suckling triplets ( Treacher, 1983; Sonwder and Glimp, 1991). The peak lactation yield is at least 25% grater than the yield of early lactation (Gatenby, 1986).

**Effect of fish oil addition on ewe lambs productive performance:**

**Average live body weight of growing lambs:**

Average live body weight of ewe lambs at successive months of the experimental period as affected by fish oil addition are presented in Table (4).

**Table (4): Average live body weight (kg) of ewe lambs of the experimental groups.**

| Age(month) | Experimental group | | | Overall mean |
|---|---|---|---|---|
| | Control | Group 2 | Group 3 | |
| 3 | 14.1 ±1.0 | 14.6 ±0.9 | 14.6 ±1.0 | 14.5±0.6 |
| 4 | 15.2 ±0.9$^{b}$ | 19.0 ±1.0$^{a}$ | 19.0 ±1.3$^{a}$ | 17.7±0.7 |
| 5 | 16.4 ±0.9$^{b}$ | 21.7 ±1.4$^{a}$ | 21.0 ±1.6$^{a}$ | 19.7±0.9 |
| 6 | 20.1 ±1.4 | 22.9 ±1.4 | 24.5 ±2.2 | 22.1±1.1 |
| 7 | 21.7 ±1.7 | 24.6 ±1.4 | 25.9 ±1.9 | 24.4±1.0 |
| 8 | 22.8 ±1.2$^{b}$ | 29.1 ±1.9$^{a}$ | 29.5 ±2.1$^{a}$ | 26.8±1.2 |
| 9 | 24.4 ±1.5$^{b}$ | 31.7 ±2.2$^{a}$ | 34.6 ±2.1$^{a}$ | 30.6±1.3 |
| 10 | 28.2 ±1.5$^{b}$ | 34.2 ±1.5$^{a}$ | 38.1 ±2.2$^{a}$ | 33.5±1.3 |
| 11 | 29.7 ±1.3 | 36.9 ±1.9 | 39.0 ±2.2 | 34.2±1.3 |
| 12 | 33.2±1.4$^{b}$ | 41.1±1.6$^{a}$ | 42.6±2.0$^{a}$ | 38.9±1.2 |
| Overall mean | 22.6±1.3 | 27.6±1.5 | 28.9±1.9 | 26.4±1.1 |

**a, b Means within the same row with different superscripts are significantly different at(P<0.05)**

Results revealed that average monthly live body weight of lambs in all experimental groups tended to gradually increase with advancing animals ages. However, the values of live body weight of lambs in group 2 and 3 tended to be significantly higher (P<0.05) than of those in control group at most times.

At the end of the experimental period (the 12$^{th}$ month), final live body weight of ewe lambs fed 1.5% (G2) and 3% (G3) fish oil increased by about 19.22 and 22.1% when compared with the control group. These results are in agreement with the results of El-Badawy (2008), who found that the addition of fish oil increased feed intake which led to increase the live body weight of ewe lambs.

Generally, the experimental results revealed that an average live weight (35.6–37.8 kg) obtained at puberty age tended to be higher than those reported by Aboul-Naga (1977); Abbas (1978) and Shalaby (1980) for ewe lambs ranging between 22.3 and 29.8 kg. However, in Rahmani ewe lambs, El-Gohary (2008) found that the average live body weight at puberty ranged from 32.2 to 35.9 kg.

These differences may be attributed to the favorable climate condition; level of energy intake; type of nutrition and breed of ewe lambs (Shalaby, 1980 and Aboul-Naga et al., 1981).

**Average daily gain:**

Average daily gain of ewe lambs at different experimental intervals are presented in Table (5).

Through the whole experimental period (9 months), an average daily gain of ewe lambs recorded the highest value (P<0.05) for ewe lambs fed 3% fish oil (103.7 g) followed by those fed 1.5% fish oil (98.15 g), while the control group had the lowest average daily gain value (70.74 g). However, the differences in an average daily gain between $G_2$ and $G_3$, were not significant but the difference between both treated groups ($G_2$ and $G_3$) and control group were significant (P<0.05).

**Table (5): Effect of feeding the experimental diets on daily weight gain (g) of ewe lambs.**

| Age(month) | Experimental groups | | | Overall mean |
|---|---|---|---|---|
| | Control | Group 2 | Group 3 | |
| 3-4 | 36.66±6.2[b] | 146.66±21.6[a] | 146.66±22.7[a] | 106.7±13.3 |
| 4-5 | 40.0±10.2[b] | 90.0±24.2[a] | 66.66±19.2[ab] | 66.67±11.5 |
| 5-6 | 123.33±19.8[a] | 40.0±10.5[b] | 116.66±31.9[a] | 80.0±15.8 |
| 6-7 | 53.33±15.0 | 56.66±25.5 | 46.66±29.7 | 76.66±14.8 |
| 7-8 | 36.66±21.1[b] | 150.0±24.2[a] | 120.0±24.2[a] | 80.0±15.2 |
| 8-9 | 53.33±20.7 | 86.66 ±19.9 | 170.0±27.4 | 126.66±13.6 |
| 9-10 | 126.66±20.5 | 83.33±30.3 | 116.66±22.5 | 96.66±14.8 |
| 10-11 | 50.0±12.1 | 90.0±13.7 | 30.0±12.4 | 23.33±7.3 |
| 11-12 | 116.66±24.2 | 140.0 ±16.6 | 120.0±29.5 | 156.66±13.6 |
| Overall mean | 70.74±4.2[b] | 98.15±4.8[a] | 103.7±9.1[a] | 90.37±6.1 |

**a, b Means within the same row with different superscripts are significantly different at(P<0.05).**

Average daily gain of ewe lambs fed 1.5 ($G_2$) and 3% ($G_3$) fish oil was higher by about 27.93 and 31.78% compared with the control group. Similar results were reported by El-Gohary (2008), who found that the average daily gain was insignificantly higher by about 7.8% through the interval from 2 months of age and significantly (P<0.01) higher by about 24% through the interval from 8 months to puberty age.

**Effect of fish oil addition on reproductive performance of ewe lambs :**

Age at puberty was recorded when ewe lambs exhibited their first estrous behaviour.

Results of puberty age in ewe lambs as affected by fish oil levels are presented in Table (6).

**Table (6): Average age (day) and body weight (kg) of ewe lambs at puberty as affected by the experimental diets.**

| Item | Experimental groups | | |
|---|---|---|---|
| | Control | Group2 | Group 3 |
| Age at 1st estrus/(days) at puberty | 318.1±10.3[a] | 273.3±5.6[b] | 290.3±8.47[b] |
| Body weight at puberty(kg) | 29.4±1.5 | 32.1±2.5 | 36.4±2.9 |

**a, b Means within the same row with different superscripts are significantly different at(P<0.05).**

Results in the present study cleared that the puberty age tended to be significantly (P<0.05) earlier in ewe lambs fed 1.5 and 3% fish oil than control group by about 45 and 28 days, respectively.

Age at puberty was early when compared with other results whereas the age at puberty ranged from 373.3 to 394.9 days in Rahmani (El-Gohary, 2008), 382 days in Ebeidi (Younis et al., 1972) and 334.6 and 314.7 days in Suffolk and their crosses with Ossimi, respectively (Gabr, 1978).

Younis et al. (1972) found that the correlation coefficient between age at puberty and each of date of birth, weaning weight and live body weight at puberty were 0.35; 0.61 and 0.84, respectively, of Eberdi ewe lambs (23–37 kg) in Egypt. Kean (1975) found a significant negative correlation (r = 0.055) between age and live body weight at puberty when the weight ranged from 30–40 kg in Suffolk × Galawy crossbred ewe lambs.

In the present study during the experimental period, age at puberty was earlier in ewe lambs fed 1.5 and 3% fish oil (273 and 290 days, respectively) and live body weight was higher (32.1 and 36 kg, respectively) than the control group (age of puberty 318 days and 29.4 kg). This early in the age of puberty may be due to faster increase in the body weight or puberty occurred at significantly lower body weight in lambs when they fed on a moderate plane of nutrition than in the high plane groups (Allen and Lamming, 1959). Also, ewe lambs fed on high nutritional level were heavier at puberty than those fed on moderate level (Gabr, 1978 and Younis et al., 1978). Moreover, Southam et al. (1971) found that the ewe lambs was significantly lighter in live body weight at puberty under limitation of fed than those self fed.

In this respect, Southam et al. (1971) found that the limitation of feeding ewe lambs resulted in a significantly higher live body weight at puberty than those self fed. Also, Guirk (1979) reported that ewe lambs which had been fed ad-libitum on Galawy and Finn galawy were significantly heavier at puberty than those fed lower level of feeding. Also, Guirke and Gosling (1979) reported that ad-libitum fed Finn galawy ewe lambs reached puberty 12.5 kg heavier than the restricted fed ones.

A strong negative relationship was found between age at puberty of ewe lambs and their growth rate and body weight (Burfening et al., 1971; Dyrmundsson, 1972). Dickerson and Laster (1975) reported that the high pre and post-weaning growth rates increased percentage of ewe lambs of American breeds reaching puberty early in the season and reducing age at puberty.

**Dry matter intake (DM), feed efficiency, feed cost and economical efficiency:**

Initial and marked body weight of ewe lambs, average final daily weight gain, total DM intake, feed cost and economical efficiency are summarized in Table (7).

Feed efficiency was 11.86, 9.46 and 8.86 kg DM/kg gain for control, $G_2$ and $G_3$, respectively. However, feed efficiency (DM/kg gain) of $G_2$ and $G_3$ was improved by about 20.24 and 25.29%, respectively due to fish oil supplement than control ration. Such superiority in improvement of fed conversion in $G_3$ as mainly due to efficiency of the feed utilization as indicated by highest body gain compared with other experimental groups. These results are in agreement with those reported by Bock et al. (1991); Moustafa et al. (1995); El-Gohary (2008).

Feed cost (LE/head/day) value was increased as the level of fish oil increased, being the lowest value with the control group (Table7). The lowest feed cost/kg gain was recorded with $G_2$ and $G_3$ (19.86 and 19.49 LE, respectively) which had the lowest (best) feed conversion (kg DM/kg gain) and the highest daily body weight gain. While, the highest feed cost/kg gain was recorded with control group (23.72 LE). This finding indicated that diet of $G_2$ (1.5%) and $G_3$ (3%) fish oil was more profitable than control group. Since feed cost/kg gain was reduced by 3.86 and 4.23 LE with $G_2$ and $G_3$, respectively, compared with the control group.

**Table (7): Growth performance of ewe lambs and feed cost of the experimental diets.**

| Item | Experimental group | | |
|---|---|---|---|
| | Control | Group2 | Group 3 |
| No. of animals | 8 | 8 | 8 |
| Duration of trail (d) | 270 | 270 | 270 |
| Initial live weight (kg) | 14.4 | 14.6 | 14.6 |
| Marked live weight (kg) | 33.2[b] | 41.1[a] | 42.6[a] |
| Total live weight gain (kg) | 18.8[b] | 26.5[a] | 28[a] |
| Daily live weight gain (g) | 69.63[b] | 98.15[a] | 103.70[a] |
| Daily feed intake DM base(kg/h/d): | | | |
| Total DM intake (kg/h/d)*** | 0.878 | 0.965 | 0.975 |
| Feed utilization efficiency: | | | |
| DM intake/kg gain | 11.86 | 9.46 | 8.86 |
| Economical efficiency: | | | |
| Feed cost/h/d (LE) | 2.0 | 2.10 | 2.20 |
| Feed cost (LE/kg/gain)* | 23.72 | 19.86 | 19.49 |
| Economical efficiency** | 1.55 | 1.86 | 1.89 |

**a, b Means within the same raw with different superscripts are significantly different at (P<0.05).**
**Price of kg live body weight is 37 LE**
***Based on the marked price at that time for hay, concentrate fed mixture and fish oil were( 600, 2200 and 6000 LE/ton, respectively) in 2013.**
****Economical efficiency = money output (price of weight gain)/ money input (price of feed consumed).**
***** 0.026 and 0.054 kg of fish oil was added and was not included in the total DM intake.**

Economical efficiency (EE) of diets in $G_2$ and $G_3$ was higher (1.86 and 1.89) than the control group (1.55). Similar results have been reported by El-Badawy (2008) and El-Gohary (2008) in this respect.

On the light of the foregoing results, it could be concluded that fish oil addition at rate of 1.5 and 3% to mature ewes had beneficial effects on productive and reproductive performance as well as for in terms of growing ewes lambs productive and reproductive performance.

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## تأثير أوميجا-٣ على الأداء الانتاجى والتناسلي في الأغنام
## ١- النعاج الناضجة والحوليات النامية

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**[1]قسم بحوث تربيه الأغنام والماعز- معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية- الجيزة- مصر.**

**[2]قسم الإنتاج الحيواني- كليه الزراعة- جامعه كفر الشيخ- مصر**

أجريت هذه الدراسة في محطة بحوث الإنتاج الحيواني بسخا التابعة لمعهد بحوث الإنتاج الحيواني-مركز البحوث الزراعية- وزاره الزراعة بالتعاون مع قسم الإنتاج الحيواني- كليه الزراعة- جامعه كفر الشيخ خلال الفترة من ابريل ٢٠١٣ وحتى نوفمبر ٢٠١٤.

و استهدفت هذه الدراسة معرفه تأثير أضافه زيت السمك بمستويين ١.٥ & ٣٪ من مقدار المادة الجافة على الأداء الانتاجى والتناسلي للنعاج الخليطه وكذلك الأداء الانتاجى والتناسلي للحوليات النامية وتناولت هذه الدراسة تجربتين.

**التجربة الأولى:**

تم اختبار عدد ٧٥ نعجة خليط (١/٢ فنلندي ×١/٢ رحماني) عمرها ٣-٦ سنوات قسمت إلى ثلاث مجموعات على أساس الوزن (بمتوسط وزن ٢.١±٤٥كجم) و حالتها التناسلية و غذيت على حسب المرحلة الانتاجيه وأضيف زيت السمك لعلائق المجموعتين الثانية والثالثة بمعدل ١.٥& ٣٪ على التوالي. وكان يتم وزن الحيوانات خلال فتره الحمل وما بعد الولادة قبل تقديم الغذاء وكذلك تقدير كميه اللبن بطريقه (تقدير لبن الرضاعة) كل أسبوعين مع ملاحظه الشياع بواسطة الكبش الكشاف مرتين يوميا.

**التجربة الثانية:**

أجريت لدراسة الأداء الانتاجى والتناسلي للحملان النامية باختبار ٢٤ حوليه خليط (١/٢ فنلندي ×١/٢ رحماني) عند عمر ٣ شهور قسمت إلى ثلاث مجموعات (٨ حيوانات في كل مجموعه بمتوسط وزن ٠.٦±١٤.٣ ).

وتم أضافه زيت السمك في المجموعتين الثانية والثالثة بمعدل ١.٥& ٣٪ على أساس المادة الجافة مقارنه بمجموعه المقارنة بهدف دراسة الأداء الانتاجى والتناسلي للحوليات خلال الفترة من ٣ إلى ١٢ شهرا من عمر الحيوان مع تحديد عمر البلوغ الجنسي في الحوليات عن طريق الكبش الكشاف.

ويمكن تلخيص أهم النتائج المتحصل عليها كالاتى:

**التجربة الأولى: تأثير أضافه زيت السمك على الأداء الانتاجى والتناسلي للنعاج.**

زاد وزن الجسم ومعدل التغير للوزن لنعاج المجموعة الثانية والثالثة عند مقارنتها بمجموعه الكنترول خلال مرحله الحمل المتأخر ولكن بدون فروق معنوية. بينما بعد الولادة وخلال فتره الرضاعة كانت نعاج المجموعة الثانية أكثر فقدا للوزن عن المجموعة الأولى والثالثة وأيضا بدون اختلافات معنوية. نسبه الشياع في النعاج كانت ٦٨٪ للمجموعة الثانية يليها الثالثة ٤٨٪ بينما مجموعه الكنترول كانت ٤٤٪. زاد معدل التوائم بزيادة كميه زيت السمك المضاف حيث كان أعلى في المجموعة الثالثة ١.٤٢٪ يليها المجموعة الثانية ١.١٧٪ و مجموعه الكنترول كانت١.١٢٪ كما أشارت النتائج إلى تحسن أنتاج اللبن الكلى بنسبه ٤٥.٢ ٪&٣٨.١ ٪ في نعاج المجموعتين الثانية والثالثة عن المجموعة المقارنة ولكن بدون اختلافات معنوية.

**التجربة الثانية: تأثير أضافه زيت السمك على الأداء الانتاجى والتناسلي للحوليات.**

أظهرت المجموعتين الثانية والثالثة ارتفاعا في الوزن الحي للجسم عند مقارنتها بمجموعه الكنترول في نهاية التجربة بنسبه زيادة حوالي ١٩.٢٢& ٢٢.١٪ عن مجموعة المقارنة. أما بالنسبة للعمر عند البلوغ الجنسي في الحوليات فكان ٣١٨& ٢٧٣.٣& ٢٩٠.٣ يوما لمجموعات الكنترول والثانية والثالثة على التوالي مع وجود تأثير معنوي للإضافات بالنسبة لعمر البلوغ الجنسي للمجموعة الثانية بحوالي ٤٤.١ يوما ويليها المجموعة الثالثة ٢٧.٨ يوما بالمقارنة بمجموعه الكنترول. أظهرت المجموعة الثانية والثالثة اعلي معدل نمو يومي (٩٨.١٥& ١٠٣.٧٠ جم/يوم على التوالي) وبفروق معنوية عن مجموعه الكنترول (٦٩.٦٣جم/يوم). بالنسبة للكفاءة الاقتصادية كانت اعلي للمجموعتين الثانية والثالثة وقيمتها ١.٨٦& ١.٨٩بينما مجموعه الكنترول كانت اقل كفاءة اقتصاديه (١.٥٥).

وعلى ضوء النتائج المتحصل عليها من الدراسة نستنتج إن أضافه زيت السمك بمعدل ١.٥& ٣٪ في المجموعة الثانية والثالثة للنعاج الناضجة كان له تأثير جيد على الأداء الانتاجى والتناسلي للنعاج وكذلك أضافه زيت السمك بنفس المعدل على الحوليات النامية كان له تأثير معنوي على معدل النمو والكفاءة التحويلية والكفاءة الاقتصادية مقارنه بمجموعه الكنترول وكذلك تبكير عمر البلوغ الجنسي.