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EFFECT OF SUPPLEMENTING SEA ALGAE (*GANODERMA*®) TO DIETS ON REPRODUCTIVE CAPABILITIES OF RABBITS

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The present work aimed to investigate the effect of supplementing different levels of sea algae in diets on fertilizing ability of bucks and fertility traits of New-Zealand White (NZW) rabbit does. The study lasted five months. A total number of 204 NZW rabbits (48 males aged 3 months and 156 females aged 2.5 months) were used in the present work. Animals were divided into three comparable experimental groups (16 males and 52 females each). The first group was fed a commercial diet and kept untreated (control group), while the 2nd and 3rd groups (treated groups) were fed the same diet but supplemented with 200 and 400 g sea algae/ ton diet, respectively.

***Results obtained indicated that**, age at first mating of NZW rabbit males significantly (P ≤ 0.05) decreased, while weight at first mating and alive body weight significantly (P ≤ 0.05) increased due to feed diets supplemented with different levels of sea algae. Absolute and relative weights of testes; epididymis; sexual accessory glands and pituitary gland, as well as, scrotal circumference; testicular index and mating activity of NZW rabbit bucks increased significantly (P ≤ 0.05 or 0.01) in descending order with diets supplemented with 400 and 200 g sea algae, respectively. Male and female sexual hormones significantly (P ≤ 0.01) increased due to sea algae supplementation to the diets.*

Conception and abortion rates, litter size and weight at birth and at weaning, as well as, bunny weight at birth and at weaning were improved significantly (P≤0.05 or 0.01) by supplementing 400 and 200 g sea algae, respectively.

Milk yield and composition and total pre-weaning mortality rates improved significantly (P≤0.05 or 0.01) by feeding diets supplemented with sea algae.

***Conclusively,** it could be concluded that, supplementing sea algae to NZW rabbit diets caused significant improvement in fertilizing ability of bucks and fertility traits of does. From the economical point, 200 g/ ton diet is recommended for rabbits.*

Keywords: Rabbits; sea algae; *Ganoderma*®; reproductive; fertility; milk.

The gab between demand and available of animal protein for human consumption is a serious problem in the developing countries including Egypt (Abd El-Razik *et al.*, 1999 and Seleem *et al.*, 2006 and 2007). Solving this problem could be realized by rabbit farming (FAO, 1987). Rabbits characterized by short generation interval; rapid growth rate and high feed efficiency and conversion; high reproductively and prolificacy, as well as, rabbit meat owns a high protein and nutritional value and less fat and cholesterol content compared to other kind of meat (Delaveau, 1981; Anon, 1982; Bayoumy, 1986 and Seleem, 2003).

Rabbit production needs more studies to improve feed conversion and to protect animals against pathogens through using alternative sources of antibiotics as feed additives. Rabbit's feed additives usage is one of the ways to maximize their efficiency of production, modifying gut micro flora balance positively, protect intestinal mucosal tissues against pathogens - enter invasive *Escherichia* coli- and enhance immunity (Resta-Lenert and Barrett, 2003). Supplementation of various stimulators to rabbits feed now is widely used in order to improve productive and reproductive performance and maximize the utilization of nutrients and meat quality (Boulous *et al*., 1992). From another point of view, several countries have prevented the application of some feed additives for their side effects on both animal and human body. It is interest to replace these additives with other natural products have no bad effects on both animal and human welfare (Ali and Mervat Ghazal, 2013). Attention hasn't been focused on the role and stimulant effect of sea algae (*Ganoderma*) on rabbit performance. Previous studies reported the essential role of sea algae, which contains most of the protein and essential amino acids (Mariey *et al.*, 2012 and Ali and Mervat Ghazal, 2013).

Several investigators decided that, sea algae has ability to improve human immune system, increase milk production in nursing women, regulate digestion; absorption and fight the internal parasites (Windisch *et al.*, 2008 and Steiner, 2009). Supplementing sea algae to the rabbit diets could improve semen quality and preservation of rabbit bucks and fertility traits of rabbit does (Ali and Mervat Ghazal, 2013). There are lack and shortage studies on using sea algae as a feed additive in rabbit industry.

Therefore, the main objective of the present study was to evaluate some parameters related to reproductive capabilities of New Zealand White (NZW) rabbits as influenced by supplementation of sea algae to the diet.

MATERIALS AND METHODS

Animals and general management

The present study was conducted in an Industrial Rabbitry, El-Azeziah Vilage, near Sakarah city, Giza Province, Egypt. The laboratory work was carried out in Animal Production Research Institute, Agriculture Research Center, Dokki, Giza, Egypt.

The ingredients and chemical composition of the pelleted ration fed to rabbits, during the experimental period is shown in Table 1**.**

Composition and chemical analysis of sea algae (Ganodarma®) used in the experiment are shown in Table 2.

The experimental work

Two hundred and four New-Zealand White (NZW) rabbits (48 males aged 3 months, and 156 females aged 2.5 months) were used. The study aimed to evaluate reproductive capabilities of rabbits as influenced by different levels of sea algae in diets. All animals in each experiment were divided into three equal comparable experimental groups (16 males and 52 females each). The first group was kept untreated (control group) and fed a commercial diet covering the nutritional requirements of different physiological status of rabbits according to NRC (1994) recommendations, while the 2nd and 3rd groups (treated groups) were fed the same diet but supplemented with 200 and 400 g sea algae/ ton feed, respectively. The study lasted five months and included two experiments as follow:-

First experiment was designed to evaluate age and weight at first mating; pituitary gland and some sexual organs weight; mating activity; scrotal circumference; testicular index and testosterone concentration of NZW rabbit bucks as affected by different levels of *sea algae* in diets, during pre-mature period.

Age and weight of rabbit males at first mating were recorded. At 5 months of age, three bucks from each group were randomly taken for slaughter after being fasted for 12 hours (Abd El-Monem, 1995). After complete bleeding, testes; epididymis; sexual-accessory glands and pituitary gland were weighed and relative weights of those organs were calculated according to the following formulae:

Relative weight of organ = Organ weight/ Alive body weight (Fu-Chang *et al.,* 2004). Scrotal circumference was measured by the method described by Boiti *et al.* (2005) and Mickelsen *et al.* (1982).

Testicular index (length × width × depth) was calculated in cubic centimeters as recorded by Castellini *et. al.* (2006) and El-Kholy *et. al.* (2012).

Table 1. The ingredients (%) and calculated chemical composition of the pellet ration fed to rabbits, during the experimental period.

Ingredients	**(%)**	**Vitamins & Minerals premix per Kg.**	
Clover hay	40.50	Vit.A (IU)	10000
Wheat bran	25.00	Vit. D3 (IU)	9000
Yellow corn	14.00	Vit. E (IU)	10000
Soybean meal (44%)	11.00	Vit. K (IU)	3
Molasses	3.00	Vit. B1 (IU)	2
Vinass	3.00	Vit. B2 (IU)	6
Bone meal	1.75	Vit. B6 (IU)	2
Lime stone	0.70	Biotin (mg)	0.2
Sodium chloride	0.55	Choline (mg)	1200
Vitamins & Mineral Premix	0.35	Niacine (mg)	40
DL-Methionine	0.15	Zn. (mg)	60
Total	**100**	Cu. (mg)	0.1
Calculated chemical composition* *		Mn. (mg)	85
Crude protein (CP)%	18.00	Fe. (mg)	75
Ether extract (EE)%	3.00	Folic acid (mg)	5
Crude fiber (CF)%	14.00	Pantothenic acid (mg)	20
Digestible energy (Kcal/Kg)	2720.00		

Calculated according to **NRC (1994) for rabbits.

Table 2. Composition and chemical analysis of sea algae.

Items	**(%)**
Glucose (mg/ dl)	21.90
Total protein (g/ dl)	03.70
Albumen (g/ dl)	00.60
Globulin (g/ dl)	03.13
Phosphorus (mg/ dl)	01.64
Calcium (mg/ dl)	48.59
Sodium (g/ dl)	01.45
Potassium (g/ dl)	02.04
Magnesium (g/ dl)	07.48
Iron (mg/ dl)	08.40
Zinc (mg/ dl)	00.54
Copper (mg/ dl)	00.53
pH	03.60

Mating activity (frequency of mating within 20 minutes) of mature rabbit bucks was determined using sexually receptive does.

Second experiment aimed to study the effect of supplementing different levels of sea algae to diet on fertility traits; milk yield and composition and pre-weaning mortality rate.

Regarding sexual hormones, during the 5th month of age, blood samples were taken from the marginal ear vein of six rabbit bucks and does per group weekly up to 4 weeks. Blood serum testosterone concentration of bucks and estradiol $17_{2\alpha}$ and progesterone levels of does were determined using RIA Kits (Immunotech, A Coulter Co., France) according to the manufacturer information.

Fertility traits

Natural mating was carried out by transferring each doe to the buck's cage to be mated and return back to its cage after mating. Palpation of all rabbit does was carried out 12 days post mating to determine pregnancy as studied by Amal Hekal *et. al.* (2013) and Safaa Barakat *et al.* (2013). Conception; abortion; kindling rates and litter size and weight at birth and bunny weight at weaning were recorded. Pre weaning mortality rates and milk yield per doe were estimated also during the suckling period. Milk yield was estimated after deprivation of pups from suckling their mothers at 8 a.m. daily, then the doe and her pups were weighed before and after suckling, the average of decrease and increase in doe and pup's weight, respectively, was used as the doe milk yield.

Milk samples were taken from nursing does individually within each experimental group, on the 21st day of lactating period (peak of milk production). A part of fresh milk sample was immediately analyzed to estimate milk (protein, fat, lactose and ash), by using Milkoscan® analyzer-130 B, N. Foss Electronic-Denmark.

Statistical analyses

Data were subjected to analysis of variance according to Snedecor and Cochran (1982) using the General Linear Model Program of SAS (2001). Duncan's new multiple range tests were used to test the significance of the differences among means (Duncan, 1955). Data presented as percentages were transformed to the corresponding arcsine values (Warren and Gregory, 2005) before being statistically analyzed.

RESULTS AND DISCUSSION

Male performance

Data presented in Table 3 indicated that, supplementing 400 and 200 gm sea algae to NZW rabbit males significantly ($P \leq 0.05$) decreased in descending order, respectively, their age at first mating, while weight at first mating significantly ($P \leq 0.05$) increased. Absolute and relative weights of testes; epididymis; sexual accessory glands and pituitary gland of NZW rabbit bucks increased significantly ($P \leq 0.05$) due to feed diets supplemented with 400 and 200 gm sea algae.

Table 3. Age and weight at first mating and pituitary and some sexual organs weight of NZW rabbit males fed diets supplemented with different levels of sea algae (Means ± SE).

Parameters	*Ganoderma* levels (gm/ Ton)		
	(0.0) Control	(200) T_1	(400) T_2
Age at first mating (Days)	171.21±5.71 [a]	158.63±3.84 [b]	152.73±4.01 [b]
Weight at first mating (g)	3011.6±45.8 [b]	3097.7±37.9 [a]	3120.6±41.6 [a]
Pre slaughter body weight (g)	3017.5±38.3 [b]	3093.6±34.7 [a]	3124.4±35.2 [a]
Testes weight:			
Absolute (g)	5.72±0.24 [c]	6.27±0.27 [a]	6.55±0.30 [a]
Relative (%)	0.190±0.003 [c]	0.203±0.003 [b]	0.210±0.002 [a]
Epididymis weight:			
Absolute (g)	0.932±0.005 [c]	0.977±0.007 [b]	1.032± 0.007 [a]
Relative (%)	0.031± 0.001 [c]	0.032± 0.001 [b]	0.033±0.001 [a]
Sexual-accessory glands weight:			
Absolute (g)	3.37±0.11 [c]	3.64±0.14 [b]	3.79±0.14 [a]
Relative (%)	0.112±0.002 [c]	0.118±0.002 [b]	0.121±0.001 [a]
Pituitary gland weight:			
Absolute (g)	0.341 ± 0.009 [b]	0.362 ± 0.010 [a]	0.391± 0.024 [a]
Relative (%)	0.011± 0.000 [c]	0.012± 0.001 [b]	0.013± 0.001 [a]

Means bearing different letter superscripts (a,b,c) within the same row are significantly ($P \leq 0.05$ or 0.01) different.

Table 4 showed that, mating activity; scrotal circumference and testicular index of NZW rabbit bucks fed diets supplemented with 400 and 200 gm sea algae were significantly ($P \leq 0.05$ or 0.01) higher, and in descending order, respectively, as compared with those of un-supplemented diets.

Regarding sexual hormones, male and female sexual hormones of NZW rabbits represented by concentration of testosterone; estradiol $17_{2\alpha}$ and progesterone recorded a significant ($P \leq 0.01$) increase, in descending order, due to diet supplemented with 400 and 200 gm sea algae, respectively (Table 5).

These results are in agreement with those obtained by Mariey *et al.* (2012) and Ali and Mervat Ghazal (2013). The results are also partially in parallel with those recorded by Metwally *et. al.* (2002) with probiotic; Seleem *et. al.* (2007) with prebiotic; Seleem *et. al.* (2011) with symbiotic and Amal Hekal *et. al.* (2013) with Gibberellic and Boric acids.

The improvement in male performance and sexual hormones of treated rabbits may be due to improving of feed utilization (Mariey *et al.*, 2012 and Ali and Mervat Ghazal, 2013) also, dietary inclusion of red sea algae can partially offset the adverse effects of toxins on animal performance. As well as, the results obtained may be due to enhance

Table 4. Some parameters indicated fertilizing ability of NZW rabbit bucks fed diets supplemented with different levels of sea algae (Means ± SE).

Item	*Ganoderma* levels (gm/ Ton)		
	(0.0) Control	(200) T_1	(400) T_2
Mating activity (no. of mating/ 20 minutes)	2.03±0.12 [b]	2.89±0.16 [a]	2.97±0.14 [a]
Scrotal circumference (Cm)	6.91±0.76 [b]	8.74±0.92 [a]	8.92±0.88 [a]
Testicular index (Cm^3)	5.46±0.59 [b]	7.28±0.74 [a]	7.41±0.81 [a]

Means bearing different letter superscripts (a, b) within the same row, are significantly ($P \leq 0.05$ or 0.01) different.

Table 5. Sexual hormones concentration of NZW rabbits fed diets supplemented with different levels of sea algae (Means ± SE).

Item	*Ganoderma* levels (gm/ Ton)		
	(0.0) Control	(200) T_1	(400) T_2
Testosterone concentration (ng/ ml)	5.83±0.04 [b]	5.97±0.07 [a]	6.02±0.08 [a]
Estradiol- $17_{2\alpha}$ (pg/ ml)	27.54±1.12 [b]	30.09±1.27 [a]	31.00±1.41 [a]
Progesterone (pg/ ml)	0.723±0.041 [b]	0.817±0.044 [a]	0.835±0.051 [a]

Means bearing different letter superscripts (a,b,c) within the same row are significantly ($P \leq 0.05$ or 0.01) different.

immune function as a result of adding red algae to the diet (Qureshi *et al.*, 1994 and 1995). These results emphasize the hypothesis that, rabbit fertility could be improved by stimulation of testicular androgen secretion induced by having diet contained red algae.

Doe traits

Data presented in Table 6 showed that, NZW rabbit does fed diets supplemented with 400 and 200 gm sea algae using bucks treated with the same treatment, recorded conception; abortion and kindling rates; litter size and weight and bunny weight at birth and at weaning significantly ($P \leq 0.05$ or 0.01) better, and in descending order, than of those recorded by does fed un-supplemented diet.

Improving fertility traits of rabbit does treated with sea algae can be attributed mainly to improve of semen quality, as recorded previously by Ali and

Table 6. Fertility traits of NZW rabbit does fed diets supplemented with different levels of sea algae using natural mating (Means ± SE).

Items	*Ganoderma* levels (gm/ Ton diet)		
	(0.0) Control	(200) T_1	(400) T_2
No. of mated does	52	52	52
No. of pregnant does	33	41	44
No. of kindled does	32	41	44
Abortion rate (%)	3.03 [a]	0.00 [b]	0.00 [b]
Conception rate (%)	63.46 [c]	78.85 [b]	84.62 [a]
Kindling rate (%)	61.54 [c]	78.85 [b]	84.62 [a]
Litter size at birth (No.)	5.84±0.37 [b]	6.92±0.51 [a]	7.88±0.57 [a]
Litter weight at birth (g)	252.6±22.6 [b]	292.4±29.3 [ab]	330.6±34.2 [a]
Bunny weight at birth (g)	43.11±1.99	42.17±1.89	41.87±2.06
Litter size at weaning (No.)	4.97±0.24 [c]	6.43±0.30 [b]	7.56±0.33 [a]
Litter weight at weaning (g)	3486.9±69.4 [c]	5142.7±81.0 [b]	6247.3±96.3 [a]
Bunny weight at weaning (g)	701.4±32.6 [b]	799.6±37.3 [a]	826.2±33.7 [a]

Means bearing different letter superscripts **(a,b,c**) within the same row are significantly ($P \leq 0.05$ or 0.01) different.

Mervat Ghazal (2013). In this respect, Lavaraa *et al.* (2005) observed significant correlations between fertility rate and semen quality.

Results in Tables 7 and 8 indicated that, milk yield and composition (protein; fat; lactose and ash) and pre-weaning mortality rate significantly ($P \leq 0.05$ or 0.01) better, and in descending order due to diet were supplemented with 400 and 200 gm sea algae, respectively.

In this respect, Mariey *et al.* (2012) found that, adding red algae to the rabbit diet caused an increase of feed efficiency. This may lead to increase milk production and secretion in treated rabbits. Beside that, the increase in milk production may be due to increase in litter size at birth (Table 6), where there was a positive correlation between the litter size at birth and milk yield (Lebas *et al.*, 1997 and Rommers *et al.*, 2001).

The improvement in litter traits proved that, the sea algae is capable to improve the milking ability of the rabbit does which is reflected in her care and ability to suckle her young till weaning. Mariey *et al.* (2012) emphasized the essential role of red algae in regulating various reproductive processes of rabbits. Ali and Mervat Ghazal (2013) recorded a significant improvement in rabbit reproductivity due to sea algae supplementation.

Regarding mortality rate, sea algae may be has a role in reduced mortality rate by its role in modify pH of rabbit digestive tract promoting

Table 7. Milk yield (gm) of NZW rabbit does fed diets supplemented with different levels of sea algae (Means ± SE).

Period (Days)		*Ganoderma* levels (gm/ Ton diet)			Means ± SE
From	To	(0.0) Control	(200) T_1	(400) T_2	
Birth	7	471.72 ±33.61 [b]	561.83 ±39.65 [a]	589.64 ±42.17 [a]	541.06 ±31.74 [C]
8	14	641.63 ±34.41 [b]	736.08 ±37.12 [a]	781.42 ±41.51 [a]	719.71 ±35.82 [B]
15	21	792.16 ±41.74 [b]	954.37 ±47.12 [a]	1047.14 ±46.72 [a]	931.22 ±41.69 [A]
22	28	523.47 ±33.59 [c]	657.07 ±36.29 [b]	821.29 ±41.72 [a]	667.28 ±34.17 [B]
29	35	407.19 ±27.22 [b]	481.63 ±32.47 [a]	529.16 ±34.01 [a]	472.66 ±31.63 [D]
Means ± SE		567.23 ±28.19 [c]	678.20 ±28.86 [b]	753.73 ±32.71 [a]	666.39 ±27.14
Birth	35	2836.17 ±39.51 [c]	3390.98 ±46.72 [b]	3768.65 ±48.29 [a]	3331.93 ±34.72

Means bearing different letter superscripts (**a,b,c**) within the same row, or (**A,B,C,D**) within the same column are significantly ($P \leq 0.05$ or 0.01) different.

Table 8. Milk composition and total pre-weaning mortality rates of NZW rabbit does fed diets supplemented with different levels of sea algae (Means ± SE).

Milk composition	*Ganoderma* levels (gm/ Ton diet)		
	(0.0) Control	(200) T_1	(400) T_2
Milk Protein (%)	11.34±0.42 [b]	12.36±0.44 [a]	12.81±0.51 [a]
Milk fat (%)	17.52±0.54 [b]	18.97±0.71 [a]	19.86±0.74 [a]
Milk lactose (%)	3.89±0.29 [b]	4.53±0.31 [a]	4.69±0.31 [a]
Milk ash (%)	3.71±0.35 [b]	4.54±0.39 [a]	4.67±0.38 [a]
Total pre-weaning mortality rate (%)	10.86 [a]	5.87 [b]	3.74 [c]

Means bearing different letter superscripts (**a,b,c**) within the same row, are significantly ($P \leq 0.05$ or 0.01) different.

useful bacteria and inhibit the harmful ones (Heindel *et al.*, 1994; Catherine *et al.*, 1996; Kamel *et al.*, 2009 and Amal Hekal *et. al.*, 2013). Furthermore, the possibility of antimicrobial activity of the sea algae may be accounted for by their growth-promoting effects on *bifidobacteria* and *lactobacilli*. These bacteria can reinforce the barrier function of the intestinal mucosa, helping in the prevention of the attachment of pathogenic bacteria, essentially by crowding them out. These bacteria may also produce antimicrobial substances and stimulate specific antigen and nonspecific

immune responses (Macfarlane and Cummings, 1999 and Roberfroid, 2000). On the other hand, the milk available per kit may also have a pronounced effect on the mortality of young rabbits (Rommers *et al.*, 2001 and Szendro *et al.,* 2002).

It is interested to note that, the improvement in all parameters studied indicated reproductive capabilities of rabbit males and females were arranged descendingly ($P \leq 0.05$ or 0.01), as obtained by 400 and 200 gm sea algae/ ton, respectively. On the other hand, 400 gm sea algae/ ton recorded non-significant improvements in most studied parameters compare to 200 gm/ ton.

Conclusively, it could be concluded that, supplementing either 200 or 400 gm sea algae/ ton diet of NZW rabbits, improved male and female reproductivity. Economically, 200 gm sea algae/ ton diet is recommended for mature rabbits. More studies and researches on using sea algae in rabbit's production are required.

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تأثير إضافة الطحالب الحمراء (الجانوديرما) إلى العلائق على كفاءة الأرانب التناسلية

ميرفت نبيل ابراهيم غزال ؛ وائل على حسن على؛ أمل مغاورى هيكل؛ طارق سليمان توفيق سليم

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الهدف من هذه الدراسة هو تقييم تأثير إضافة مستويات مختلفة من الطحالب الحمراء إلى علائق الأرانب النيوزيلندى البيضاء على المقدرة الإخصابية للذكور، والكفاءة التناسلية

للإناث. إستمرت الدراسة خمسة أشهر باستخدام عدد ٢٠٤ أرنب نيوزيلندى أبيض (٤٨ ذكر عمر ٣ أشهر، و١٥٦ أنثى عمر ٢,٥ شهر) عند بداية التجربة.

قسمت الأرانب إلى ثلاثة مجموعات تجريبية متماثله، (١٦ ذكر، بالإضافة إلى ٥٢ أنثى فى كل مجموعة). غذيت المجموعة الأولى على عليقة تجارية وبقيت بدون معامله (مجموعة المقارنة)، بينما غذيت المجموعتين التجريبتين الثانية والثالثة على نفس العليقة، ولكن أضيف إليها ٢٠٠ و ٤٠٠ جم من مستخلص الطحالب الحمراء لكل طن، على الترتيب.

أظهرت النتائج إنخفاض معنوى (عند مستوى ٥%) فى عمر ذكور أرانب النيوزيلندى البيضاء عند أول تلقيحه، بينما زاد معنوياً كل من الوزن عند أول تلقيحة والوزن الحى نتيجة لإضافة مستويات مختلفة من الطحالب الحمراء للعلائق. سجلت الأوزان النسبية والمطلقة لكل من الخصيتين؛ والبربخ؛ والغدد الجنسية المساعدة؛ والغدة النخامية، وكذلك محيط كيس الصفن والدليل الخصوى بالإضافة إلى النشاط التزاوجى لذكور أرانب النيوزيلندى البيضاء المغذاه على علائق مضاف إليها مستويات مختلفة من الطحالب الحمراء زيادة معنوية وفى ترتيب تنازلى نتيجة لإضافة ٤٠٠ جم، و٢٠٠ جم طحالب حمراء لكل طن علف، على الترتيب. أدى إضافة مستويات مختلفة من الطحالب الحمراء إلى علائق الأرانب إلى زيادة معنوية فى تركيز الهرمونات الجنسية الذكرية والأنثوية (التستسترون، الإستراديول، والبروجسترون).

بالنسبة لمعدلات خصوبة الإناث متمثلة فى (معدلات كل من الحمل، والإجهاض، والولادات، وقيم كل من عدد ووزن خلفات البطن عن الميلاد وعند الفطام، وكذلك وزن الخلفة الواحدة عند الميلاد وعند الفطام) كانت أفضل معنوياً وفى ترتيب تنازلى، نتيجة لإضافة ٤٠٠ جم، ٢٠٠ جم طحالب جمراء لكل طن علف، على الترتيب.

أدى إضافة مستخلص الطحالب الحمراء إلى علائق الأرانب إلى تحسين معنوى فى محصول ومكونات اللبن، وكذلك فى معدلات نفوق الخلفات، خلال فترة الرضاعة (من الميلاد وحتى الفطام).

التفوق المعنوى الذى سجل فى كل النتائج الدالة على الكفاءة الإخصابية لذكور وإناث الأرانب، كان مرتب ترتيباً تنازلياً نتيجة إضافة ٤٠٠ جم، و٢٠٠ جم من مستخلص الطحالب الحمراء لكل طن علف، على الترتيب، فى حين أن المجموعة التى غذيت على عليقة مضاف إليها ٤٠٠ حم مستخلص الطحالب الحمراء كانت أفضل ولكن غير معنوية عن تلك التى غذيت على عليقة مضاف إليها ٢٠٠ جرام طحالب، بالنسبة لمعظم الصفات المدروسة فى هذه الدراسة.

التوصية: عموماً يمكن أن نستخلص من الدراسة أن، إضافة الطحالب الحمراء إلى علائق الأرانب أدى إلى تحسن معنوى فى المقدرة الإخصابية للذكور، والكفاءة التناسلية للإناث، من الناحية الإقتصادية، فإنه يوصى بإضافة ٢٠٠ جرام مستخلص الطحالب الحمراء لكل طن عليقة أرانب.