Egyptian Journal of Rabbit Science, 34(2): 123- 144(2024)

GROWTH PERFORMANCES AND SOME RELATED BLOOD BIOCHEMICAL CHANGES OF GROWING RABBITS AS INFLUENCED BY FEEDING VARYING LEVELS OF DRIED SEA GRASS (*Posidonia oceanica*) UNDER NORTH SINAI CONDITIONS

E. O. A Bakr; Esraa, G. Shalapi; M. R. M. Mousa and A.M. Abdel-Samee
Department of Animal and Poultry Prod., Faculty of Environ. Agric. Sci., Arish University, El-Arish, North Sinai, Egypt.
***e-mail**:elsayedoab@gmail.com, essgamal115@gmail.com shafisame@ gmail. com*

ABSTRACT

This study aimed to use sea grass (Posidonia oceanica, PO) as a partial substitute of alfalfa hay in growing rabbits' diets. Also, to maintain the ecological balance, prevent environmental pollution and get rid of this marine waste. Forty-eight New Zealand White (NZW) rabbits, (aged 6 wk. and weighted about 749±24.22 g) allocated into comparable four groups (12 rabbits in each). Each group was divided into (4 replicate in each). The 1st group fed on basal diet (CON). The other three groups (SGR1, SGR2 and SGR3) fed on diets containing 7.5 ,15 and 22.5 % Posidonia oceanica, respectively. At the end of experiment, digestibility trial was carried out to assess the digestibility and nutritive values of the tested diets. Four rabbits from each treatment group were slaughtered to evaluate carcass traits, some blood indices and economic efficiency .

Results showed that feeding PO up to 22.5% did not effect on growth performance traits, such as live body weight (LBW), total weight gain (TWG), daily weight gain (DWG), total and daily feed intake, feed conversion ratio (FCR), relative growth rate (RGR) and performance index (PI) at different ages (6- 14 weeks of age). Viability of SGR3 group was 83.33% versus 100% for the other three groups (CON, SGR1 and SGR2). Insignificant differences were registered in DM, CP and EE digestibility among the experimental diets. However, OM and NFE digestibility of CON diet were higher (P<0.05) than those of diets contains PO. CF digestibility was decreased significantly with increasing of PO inclusion in the experimental diets. Nutritive values as DCP (%), TDN (%) and DE (Kcal/ kg diet) were decreased significantly with increasing levels of PO inclusion in the diets. Inclusion of PO in rabbit diets did not show any significant effect on all carcass traits, except abdominal fat, which was lower (P<0.05) in SGR1 as compared to CON group. No significant differences among treatment groups in most blood indices were *observed, except albumin, Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST) and urea. Albumin value was lower (P<0.05) in SGR1 than CON group. Increasing of PO levels in the rabbit diets significantly affected ALT enzyme. However, SGR3 had higher value (P<0.05) than the other three groups. Serum AST was lower (P<0.05) in SGR2 group than CON and SGR1 groups. U-Nitrogen in SGR1 was lower (P<0.05) than in SGR2 and SGR3 groups. The present results showed that all serum parameters were in the normal range. The results showed that there were no significant differences between the comparison group and the rest of the experimental groups in most growth traits and blood characteristics.*

***Conclusively,** it can be concluded that it is possible to replace PO up to 22.5% instead of expensive alfalfa hay in rabbit diets after weaning, which results in increasing the economic feasibility and reducing the cost of producing a kilo of meat in rabbit production farms. It could be concluded that dried Posidonia oceanica can be used up to 22.5% as replacement of alfalfa hay in rabbits' diets without any harmful effects on growth performance, health status and economic efficiency under North Sinai conditions.*

***Key words:** rabbits, Posidonia oceanica, digestibility, carcass traits, blood metabolites, economic efficiency.*

INTRODUCTION

There is a wide nutritional gap between the amount of animal protein required for human nutrition and the amount produced in developing countries, including Egypt. The rabbit production industry can be used to fill this gap and solving this problem (**Abdel-Razek *et al.*,1999**). Rabbits have been recognized to have a very important role to play in the supply of animal protein. Rabbits are characterized by high fertility, short generation duration, high number of offspring, fast growth rate and low cost of producing a kilo of meat, as well as, rapid growth rate and high feed efficiency and conversion, high reproductivity and prolificacy, as well as rabbit meat owns a high protein and nutritional value and less fat and cholesterol content compared with other kind of meat (**Abdel-Samee, 1995 & 1997, Abdel-Samee *et al*., 2003 & 2014 and Daader *et al*., 2016**).

Rabbits can be successfully raised on diets rich in fiber-containing by-products (**Cheeke, 1986**). Fibre serves to preserve microecological balance of the gastrointestinal tract, promoting the development of digestive system and improving the efficiency of reproduction (**Gu, 2002**). The high expensive of feeding rabbits conventional feed can be avoided by using several unconventional feeds that have a reasonable nutritional content **(Khayyal *et al*., 2017 and Bakr *et al*., 2019 and 2021)**.

The use of sea grass as ruminant animal feed should be included in animal nutrition programs in order to decrease the nutritional gab between the demand and the available for livestock consumption. Also, to maintain the ecological balance, prevent environmental pollution and get rid of this marine waste. Seagrass nutritional research should be done based on the availability of the plant local (**Torbatinejad, *et al*., 2007).** In the Mediterranean, PO is an endemic sea grass *(***Boudouresque *et al.*, 2006**). It is widely spread in the Mediterranean Sea **(Davis, 1984).** PO extends along Egypt's Mediterranean coast from the far west, El Salloum, to the far east, El Arish **(Nihal and Zeinab, 2013**).

PO contains amino acids **(Augier and Santimore, 1979),** sterols **(Sica *et al.*, 1984),** fatty acids **(Viso *et al*., 1993),** carbohydrates **(Invers *et al*., 2004). Castillo *et al*. (2014)** showed that PO contains 42 CP, 13 EE, 155 ash, 760 NDF, 533 ADF and 116 ADL (g/kg DM). The NDF values found in PO indicate it is can be used as a source of fiber in the ruminant diets. Recently, **Micheli *et al*. (2021)** showed that an ethanol extract of PO leaves contains potential biological qualities such as antioxidants and anti-inflammatory compounds.

Recent studies indicated that PO is a waste that is essential for providing ruminants a source of fiber (**Castillo *et al*., 2014**). Which can help to reduce the production costs. in addition, the neutral detergent fiber content of PO suggests that it may benefit to animals fed high-grain diets by increasing saliva and chewing behaviour (**Castillo *et al*., 2015**).

Therefore, this study aimed to estimate the effects of using *Posidonia oceanica (*L.) Delile (sea grass) at graded levels instead of alfalfa hay on growth performances, digestibility coefficient, carcass traits, blood profile and economic efficiency of NZW rabbits under North Sinai conditions. Also, to maintain the ecological balance, prevent environmental pollution and get rid of this marine waste.

MATERIALS AND METHODS

This study was carried out at the Rabbitry Farm, Department of Animal and Poultry Production, Faculty of Environmental Agricultural Sciences, Arish University, North Sinai, Egypt, this study lasted for eight weeks started in April and finished in June 2022.

This work aimed to assess the effects of using varying levels of *Posidonia oceanica* (PO) as untraditional feed ingredient replacement of alfalfa hay inrabbit's diets on growth performance traits, digestibility coefficients, some blood metabolites and economic efficiency of weanling NZW rabbits, under North Sinai conditions.

Collection and preparation of Posidonia oceanica (PO):

Fresh PO (all parts of the plant) was collected from Bardawil lake in North Sinai, Egypt. Fresh PO was collected during summer of 2021 and then, sun- dried for 48 hours, until the moisture content was about 10%. It was turned many times to maintain its greenish coloration. The dried PO were grinded handily, mixed and stored in tight polyethylene until it used.

Experimental Design and diets:

Forty -eight weanling New Zealand White (NZW) rabbits unsexed, aged 6 weeks and weighed 749.34 ± 24.22 g were randomly allotted to four equal and similar treatment groups, each of 12 rabbits in 4 replicates (3 rabbits in each).

The first group (CON) was fed on pelleted basal diet, while the other three treatment groups (SGR1, SGR2 and SGR3) were fed on basal diet, which containing 7.5, 15 and 22.5 % of PO, respectively replacing 25, 50 and 75% alfalfa hay, respectively. The composition of the tested diets is shown in Table 1. Tested diets were formulated to cover the nutrients requirements of growing rabbits according to **NRC (1977)**.

Housing and management:

The rabbits were housed in galvanized wire cages (batteries) with dimensions (40*40*30). The rabbits were raised in well- ventilated building (light and natural air through windows) and under similar management, hygienic conditions.

The daily amount feed was offered one time a day at 08:00h for all groups. Drinker water and feed were provided *ad libtim* during the study period. Rabbits were individual weighed at the starting of the study then biweekly before offering the morning meal until the end of this study (14 weeks of age). Feed intake was estimated weekly during the period of study. Live body weight, total weight gain, daily gain and feed intake were recorded. Feed conversion (g feed/ g gain) was determined.

Performance index %= [(final live body weight (Kg) / feed conversion) *100] according to **North (1981).**

Viability (%) and economic efficiency were recorded and calculated.

Table 1. Composition of experimental diets.

Items	Experimental diets at different levels of PO*			
	CON	**SGR1**	**SGR2**	**SGR3**
Alfalfa hay (15%)	30.0	22.5	15.0	7.5
Posidonia oceanica	-	7.5	15.0	22.5
Yellow corn	10.55	10.55	10.55	10.55
Soybean meal (44%)	15.0	15.0	15.0	15.0
Wheat bran	25.15	25.15	25.15	25.15
Barley	16.50	16.50	16.50	16.50
Salt	0.30	0.30	0.30	0.30
Premix**	0.30	0.30	0.30	0.30
Limestone	1.05	1.05	1.05	1.05
Di-calcium phosphate	0.95	0.95	0.95	0.95
Anti- coccidia	0.1	0.1	0.1	0.1
Anti- fungi	0.1	0.1	0.1	0.1
Total	**100**	**100**	**100**	**100**

*Experimental diets; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO.
** One kilogram of premix contains Vit. A 12000 000 IU, Vit. D3 2200 00 IU, Vit. E 1000 mg, Vit. K3 2000 mg, Vit. B1 1000 mg, Vit. B2 4000 mg, Vit. B6 100 mg, Vit. B12 10 mg, pantothenic acid 3.33 g, biotin 33 mg, Folic acid 0.83 g, Choline Chloride 200 g, Zn 11.79 g, Mn 5 g, Fe 12.5 g, Cu 0.5 g, I 33.3 mg, Se 16.6 mg and Mg 66.7 g

Digestibility and nutritive values:

Digestibility trial was designed at the end of the experiment (14 weeks of age), 16 male rabbits were chosen randomly (4 from each experiment group) weighted about 2.3 Kg for determine the digestibility coefficients of nutrients and feed values for the tested diets. Rabbits housed individually in metabolic cages to collection of all dropping faeces. Preliminary period lasted 10 days however rabbits fed on the same tested diets, which offered to the rabbits during the experiment period, followed by 7 days as collection period. The feed actually consumed and total faecal output were estimated. The daily feed was offered one time a day at 08:00h for all groups. Water and feed were provided *ad libtim*. Faeces collected daily in the morning from each rabbit before offering the daily feed. Faeces of each rabbit were cleaned from fur and scattered feed. For trapping any ammonia evaporate, the faeces were sprayed 10% sulphuric acid, then dried at 60º C for 36 hours in an electric oven. All dried faeces of each rabbit were mixed together at the end of collection period, weighed, finely grinded and stored until chemical analysis. Samples of PO, tested diets and faeces were chemically analysed (**AOAC, 2012**).

TDN and DCP (%) were evaluated according to formula described as follows: by **Cheeke *et al.* (1982).**

TDN% =DCF % + DNFE % + DCP % + 2.25 (DEE %).

DCP % = (DP × CP %) /100.

DE (K cal/ Kg diet) = 5.28 (%DCP, g/kg) + 9.51 (%DEE, g/ kg) + 4.2 (% DCF+ % DNFE g/ kg) ±0.3 **according to Schiemann *et al.* (1972) cited by El- Kerdawy (1997).**

Carcass traits:

At feeding trial ending (14 weeks of age), 16 rabbits (4 rabbits in each group) were chosen to slaughter to evaluate carcass traits. Rabbits were fasted for 12 hours, weighted and slaughtered according to Islamic Method. After complete bleeding and skinning, the empty carcass with head, liver, heart and kidneys were weighted separately according to (**Cheeke, 1987**). Dressing edible parts (Empty carcass with head + giblets) as percentage of pre-slaughter was calculated.

Blood metabolites:

Blood serum was collected from each rabbit during slaughter in a clean, non- heparinized tube and allowed to clot at room temperature and then centrifuged at 3000 rpm for 15-20 min, and then the serum was separated and stored at -20º C until analysing **(Schalm *et al*., 1975).** Serum total protein and glucose were calorimetrically determined using commercial kits provided by Bio Merieux (France) according to **Henry *et al*. (1974)** and **Doumas *et al*. (1971),** respectively. Albumin, alanine transaminases (ALT) and aspartate transaminases (AST) were calorimetrically determined using Kits supplied by Randox, (England) according to **Doumas *et al*.** (**1971**) **and Reitman and Francle (1957),** respectively. The difference between total protein and albumin was used to compute the serum globulin level. A/G ratio was estimated by dividing the value of albumin on the value of globulin. Creatinine and urea nitrogen were analysed using commercial kits according to **Husdan and Rapoport** (**1968**).

Economic efficiency:

Economic efficiency was calculated as ratio between income (Price of weight gain) and outcome (Cost of feed consumed) during 6-14 weeks of age.

Statistical analyses:

Data were statistically analyzed using Least Squares Analysis of Variance according to **Snedecor and Cochran (1982)** using the **SAS (2004)** using the following fixed model for rabbits:

$$Yij = \mu + Ti + e_{ij}$$

Where, Yij = The observed value of a given dependent variable, μ = Overall adjusted mean, Ti = Effect of using varying levels of *Posidonia oceanica* (PO) in rabbit's diets (i = 1, 2 ,3 and 4) and eij = Random error.
The differences between LSM (least square means) were analyzed by Duncan's New Multiple Range-test **(Duncan, 1955**).

RESULTS AND DISCUSSION

Approximate analysis of Posidonia oceanica and experimental diets:

Table 2 revealed that the proximate chemical composition of PO and experimental diets. PO contains 11.52% CP, 11.53% CF ,1.17% EE, 41.23% NFE and 34.55 % ash. CP and ash of PO were within the range values reported by previous researches (**Castillo *et al*., 2014 and Elsaied *et al*., 2015),** while CF and EE of PO were less values than that reported by the same authors**.** This may be attributed to many factors such the depth and place, where PO was collected, the seasonal changes and degree of plant development **(Torbatinejad *et al*., 2007**). The CP, CF and EE contents of tested diets were decreased, while ash content was increased with increasing PO inclusion in the tested diets (**Table 2)**. This is attributed to the fact that CP, CF and EE (11.52, 11.53 and 1.7 %), respectively of PO were lower than that of alfalfa hay (16.27, 30.24 and 2.68 %), respectively and ash content of PO (34.55 %) was higher than that of alfalfa hay (10.68 %).

Table 2. Chemical analysis (%) of alfalfa hay, PO and treatment diets as DM %

Items (%)	**Alfalfa hay**** (Calculated)	***Posidonia oceanica***	**Dietary treatments***			
			CON	**SGR1**	**SGR2**	**SGR3**
DM	87.56	87.70	93	92.50	91.50	91.40
OM	89.32	65.45	91.61	89.81	88.02	86.19
CP	16.27	11.52	17.85	17.49	17.14	16.78
CF	30.24	11.53	13.93	12.52	11.12	9.72
EE	2.68	1.17	3.24	3.13	3.01	2.90
NFE	40.13	41.23	56.59	56.67	56.75	56.79
ASH	10.68	34.55	8.39	10.19	11.98	13.81

*Dietary treatment groups; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO.
**According Abd-Allah, (2017).

Growth performances traits:

Live body weight:

Data in Table 3 revealed insignificant differences among treatment groups in live body weight (LBW.), total weight gain (TWG.) and daily weight gain (DWG.) at different ages, from 6 to 14 weeks. Similarly, in goats, **Castillo *et al*. (2015)** reported that supplementation with the sea grass had no significant effect on body weight and milk production for dairy goat fed ration containing PO. On the other hand, **Torbatinejad and Sherlock (2008**) found that total body weight gain of the sheep, which received ration containing 75% treated PO + 25% lucerne (T_1) was significantly less than that received the other two rations (25% lucerne +75% treated wheat straw (T_2) and 25% chicken litter + 75% treated wheat straw (T_3)). **Castillo *et al*. (2017)** showed that adding any quantity of PO above 15% in sheep ration led to reduce weight gain. Slightly decreasing was observed in LBW, TWG and DWG of rabbits due to inclusion of PO in the rabbit diets may be related to lower feed intake in sea grass diets as compared to CON diet. This is because of a lack of adaptation to PO feeding during the study period **(Castillo *et al*., 2017)** and increasing DCP, TDN and DE in CON diet when compared to sea grass diets as shown in Table 6. Viability of treatment groups were 100, 100, 100 and 83.33 % for CON, SGR1, SGR2 and SGR3, respectively as shown in Table 3.

Feed intake and feed conversion ratio:

Insignificant differences among treatment groups concerning, total feed intake (TFI) and daily feed intake (DFI) were observed (**Table 4)**. Our results were in agreement with **Torbatinejad** and **Sherlock** (**2008**), who found that no significant differences among ewes' experimental diets (25% lucerne +75% treated sea grass (T_1), 25% lucerne + 75% treated wheat straw (T_2) and 25% chicken litter +75% treated wheat straw (T_3)) in dry matter intake.

On the contrary, **Castillo *et al*. (2017)** found that dry matter intake of sheep was significantly decreased when fed ration containing 60 % PO substituted by barely straw as compared to control ration. As shown in Table 4, there were no significant differences in feed conversion ratio among dietary treatments. CON group had the best value, but PO groups had the poorest values.

In the same trend, **Torbatinejad and Sherlock** (**2008**) found that feed conversion ratio of ewes fed ration containing PO (T_1) did not significant differ when compared to those of ewes fed on (T_2) or (T_3) rations. Similar feed intake in all treatment groups may be attributed to the balanced diets offered to all treatment groups (**Khadr and Abdel-Fattah, 2008**).

Table 3. Live body weight and viability % of growing rabbits as affected by *Posidonia oceanica* feeding ($\bar{X}$±SE) from 6 to 14 weeks of ages (56 days).

Items	Dietary treatment groups*				Sig. test **
	CON	SGR1	SGR2	SGR3	
Live body weight (LBW, g):					
6 Wk (Initial weight)	750.0 ±25.88	750.0 ±24.56	749.17± 22.17	748.0 ±24.26	NS
8 Wk.	1188 ±38.14	1169 ±35.96	1149 ±33.65	1147 ±23.53	NS
10 Wk.	1658 ±41.39	1566 ±63.55	1586 ±37.77	1579 ±31.36	NS
12 Wk.	2123 ±46.91	1988 ±68.74	1988 ±46.72	1992 ±34.41	NS
14 Wk.(Final weight)	2393±36.85	2269 ±64.10	2245 ±57.43	2252 ±40.93	NS
Total weight gain (TWG, g) from:					
6-8 Wk.	437.5 ±22.33	419.2 ±28.64	400.0 ±20.63	399.0 ±7.371	NS
8-10 Wk.	470.8 ±19.32	396.7 ±26.69	436.7 ±18.72	432.0 ±28.28	NS
10- 12 Wk.	464.2 ±17.90	422.5 ±39.13	402.5 ±22.33	413.0 ±16.19	NS
12- 14 Wk.	270±22.27	280.8 ±26.81	256.7 ±21.15	260.0 ±29.66	NS
6- 14 wk.	1643 ±40.16	1519±57.99	1496 ±56.19	1504 ±46.19	NS
Daily weight gain (DWG, g) from:					
6- 8 Wk.	31.25 ±1.595	29.94 ±2.046	28.57 ±1.474	28.50 ±0.527	NS
8- 10Wk.	33.63 ±1.380	28.33 ±2.795	31.19 ±1.337	30.86 ±2.020	NS
10 -12 Wk.	33.16 ±1.279	30.18 ±1.906	28.75 ±1.595	29.50 ±1.157	NS
12- 14 Wk.	14.57 ±1.591	20.06 ±1.915	18.33±1.511	18.57 ±2.119	NS
6-14 Wk.	28.16 ±0.717	27.13 ±1.036	26.71 ±1.003	26.86 ±0.825	NS
Viability %					
Animals No.	12	12	12	12	
No of dead rabbitss	0	0	0	2	
Viability %	100	100	100	83.33	

*Dietary treatment groups; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO.
** NS= Not significant

Table 4. Feed intake and feed conversion ratio of growing NZW rabbits as influenced by *Posidonia oceanica* feeding ($\bar{X}$±SE) from 6 to 14 weeks of ages (56 days).

Items	**Dietary treatment groups***				**Sig. test****
	CON	**SGR1**	**SGR2**	**SGR3**	
Total Feed intake (g.) from:					
6-8 Wk.	1042 ±25.75	1081 ±30.83	1044 ±26.30	1026 ±17.34	NS
8-10 Wk.	1444 ±48.94	1372 ±72.14	1407 ±32.58	1383 ±32.83	NS
10-12 Wk.	1748 ±53.17	1674 ±66.83	1678 ±44.52	1641± 110.3	NS
12-14 Wk.	1700 ±59.64	1635 ±45.74	1584 ±69.69	1697 ±105.0	NS
6-14 Wk.	5935 ±173.6	5762 ±159.8	5713 ±98.08	5747 ±229.2	NS
Daily feed intake (g/day) from:					
6-8 Wk.	74.49 ±1.839	77.20 ±2.202	74.58 ±1.878	73.27 ±1.239	NS
8-10 Wk.	103.2 ±3.496	97.98 ±5.153	100.5 ±2.327	98.81 ±2.345	NS
10-12 Wk.	124.9 ±3.798	119.6 ±4.773	119.9 ±3.180	117.2 ±7.876	NS
12-14 Wk.	121.4 ±4.260	116.8 ±3.267	113.2 ±4.978	121.2 ±7.497	NS
6-14 Wk.	106.0 ±3.100	102.9 ±2.854	102 .0 ±1.752	102.6 ±4.092	NS
Feed conversion ratio (g feed intake/g gain) from:					
6-8 Wk.	2.386 ±0.060	2.530 ±0.159	2.722 ±0.124	2.574 ±0.078	NS
8-10 Wk.	3.066 ±0.074	3.511 ±0.200	3.226 ±0.087	3.193 ±0.316	NS
10-12 Wk.	3.774 ±0.137	4.032 ±0.254	4.200 ±0.169	3.941 ± 0.135	NS
12-14 Wk.	6.302 ±0.283	6.153 ±0.895	6.206 ±0.181	6.618 ±0.578	NS
6-14 Wk.	3.610 ±0.065	3.795 ±0.036	3.824 ±0.048	3.784 ±0.139	NS

*Dietary treatment groups; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO.
** NS= Not significant

Relative growth rate (RGR) and performance index (PI):

The general trends of relative growth rate (%) and performance index (%) were similar to those of LBW TWG and DWG. There were insignificant differences among treatment groups.

Slightly decreasing in RGR, and PI (%) result of increasing PO in tested diets. This indicates that up to 22.5 % of PO could be added to rabbit diets without having a negative impact on productivity (Table 5).

Table 5. Relative growth rate (RGR) and performance index (PI) of growing NZW rabbits as influenced by *Posidonia oceanica* feeding from 6 to 14 weeks of ages (56 days).

Items	Dietary treatment groups*				Sig. test**
	CON	SGR1	SGR2	SGR3	
Relative growth rate (%)[1] from:					
6-8 Wk.	45.15 ±1.981	43.65±2.644	42.14±1.799	42.37±1.353	NS
8-10 Wk.	33.31 ±1.570	28.55±2.452	32.06±1.471	31.67±1.985	NS
10- 12 Wk.	24.63 ±0.925	24.06±1.716	22.52±1.208	23.18±0.942	NS
12- 14 Wk.	12.30 ±1.125	13.41±1.464	12.07±0.852	12.24±1.398	NS
6- 14 Wk.	107.1 ±2.792	100.6±2.408	99.77±2.645	100.3±2.737	NS
Performance index (%)[2] from:					
6-8 Wk.	49.89 ±1.654	46.68±2.509	42.61±2.944	45.16±2.255	NS
8-10 Wk.	54.14 ±0.923	45.15±3.251	49.22±0.902	51.64±6.046	NS
10- 12 Wk.	56.44±1.981	50.11±4.408	47.64±2.580	51.17±2.583	NS
12- 14 Wk.	37.03 ±1.563	38.90±4.870	36.27±1.285	35.07±3.082	NS
6-14 Wk.	64.43 ± 2.265	59.83±1.827	58.79±1.953	60.26±3.150	NS

*Dietary treatment groups; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO. ** NS= Not significant

[1]RGR= ([(w2-w1) / (1/2 *(w1+w2)] *100)

: W1= initial weight and W2=final weight for the same period.

[2]PI= [(Final BW, Kg / FCR) *100]

: BW= Body weight : FCR= Feed conversion ratio

Digestibility coefficients and nutritive values:

Digestibility coefficients:

As shown in Table 6, there were insignificant differences in DM, CP and EE digestibility among the experimental diets, while OM and NFE digestibility of control diet (CON) were higher ($P<0.05$) than those of diets contains PO (SGR1, SGR2 and SGR3), whereas non-significant differences were among sea grass diets (SGR1, SGR2 and SGR3). Low NFE digestibility in the diets contain PO as compared to CON diet could be because PO contains tannins, which can bind to macromolecules like proteins and polysaccharides to form complexes **(De – Bruyne *et al.*, 1999** and **Dei *et al.*, 2007**).

CF digestibility was decreased with increasing of PO inclusion in the experimental diets. CF digestibility of CON diet was higher ($P<0.05$) than those of SGR2 and SGR3 diets, while didn't differ significantly as compared to SGR1 diet. This could be because sea grass has a higher lignin fraction (ADL) content than cereal straw or other conventional feed sources. It is clear that when the proportion of PO increased, the diet's digestibility reduced **(Castillo *et al.*, 2017).**

Table 6. Digestibility coefficients and nutritive value of experimental diets (X±SE) at 14 weeks of age.

Items	Dietary treatments groups[1]				Sig. test
	CON	SGR1	SGR2	SGR3	
Digestibility coefficients (%)					
DM	68.62 ±0.598	67.46 ± 0.63	69.07 ± 0.47	69.54 ±0.93	NS
OM	75.18^{a} ±0.555	72.68^{b} ± 0.52	71.83^{b} ± 0.62	71.23^{b} ±0.75	*
CP	72.48 ±1.267	71.61 ± 1.01	71.82 ± 1.00	70.12 ±0.55	NS
CF	51.01^{a} ±1.935	43.81^{ba} ± 1.56	39.97^{bc} ± 1.20	33.26^{c} ±4.30	*
EE	64.44 ±0.758	63.20 ± 0.47	63.68 ± 1.00	66.01 ± 1.86	NS
NFE	82.59^{a} ±0.320	80.02^{b} ± 0.39	78.80^{b} ± 0.68	78.70^{b} ±0.88	*
Nutritive value					
DCP(%)	12.03^{a} ±0.21	11.66^{ba} ± 0.17	11.47^{bc} ±0.16	10.98^{c} ±0.09	*
TDN(%)	66.48^{a} ±0.50	62.73^{b} ± 0.44	60.10^{c} ±0.50	58.42^{c} ±0.60	*
DE(kcal /kg diet)	3154.4^{a} ±24.66	2979.8^{b} ±21.06	2861.5^{c} ±24.10	2785.7^{c} ±33.89	*

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

NS= Not significant, ,* =$P<0.05$.

[1]Dietary treatment groups; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO.

Nutritive value of experimental diets:

The general trends of nutritive values were comparable to those of digestibility coefficients of experimental diets, however nutritive values (DCP (%), TDN (%) and DE (K cal/ kg diet)) were decreased with increasing PO inclusion in the diets. DCP (%) of CON diet was higher ($P<0.05$) than those of SGR2 and SGR3, whereas did not differ with SGR1. TDN (%) and DE (K cal/ kg diet) of CON diet were higher ($P<0.05$) than sea grass diets (SGR1, SGR2 and SGR3). TDN and DE of SGR1 diet were greater ($P<0.05$) than SGR2 and SGR3. This may be due to low of CF and NFE digestibility coefficients in sea grass diets in comparison with CON diet (Table 6).

Carcass traits:

Data in Table 7 showed that PO inclusion in diets rabbits at different levels (7.5, 15 and 22.5 %) did not show any significant effect on all carcass traits (Empty carcass with head, giblets parts, total edible parts (dressing)), except abdominal fat. It was higher ($P<0.05$) in CON group than sea grass groups (SGR1, SGR2 and SGR3), however there were non-significant differences among sea grass groups.

Table 7. Carcass traits of growing NZW rabbits as influenced by dietary treatment (*Posidonia oceanica*) (Means ±SE) at 14 weeks of age.

Items	Dietary treatment groups[1]				Sig. test
	CON	SGR1	SGR2	SGR3	
Pre-slaughter (g)	2458 ±41.51	2293 ±117.80	2290 ±122.5	2315 ±103.5	NS
Empty carcass (g)	1445 ±59.09	1310 ±74.72	1303 ±67.13	1320 ±69.88	NS
Edible parts[2] (g)	1529 ±56.47	1384 ±82.52	1377 ±70.62	1398 s±73.70	NS
Dressing[3] (%)	62.17 ±1.29	60.32 ±0.63	60.17 ±0.99	60.33 ±0.94	NS
Liver (g)	63.99 ±4.69	53.50 ±5.97	54.39 ±3.10	56.66 ±6.17	NS
Kidneys (g)	12.94 ±0.47	13.91 ±1.48	13.77 ±0.79	14.00 ± 0.51	NS
Heart (g)	7.363 ±0.56	6.798 ±0.73	6.110 ±0.21	6.933 ±0.32	NS
Edible giblets[4] (g)	84.29 ±4.94	74.21 ±7.94	74.27 ±3.69	77.59 ±6.83	NS
Head (g)	121.4 ±4.49	120.30 ±3.88	123.0±4.47	113.5 ±3.69	NS
Abdominal fat (g)	23.76[a] ±3.58	11.69[b] ±3.26	13.86[ba] ±2.52	14.67[ba] ±4.02	*
Lungs (g)	10.65 ±0.89	11.46 ±1.17	12.4^ ±0.69	11.47 ±0.84	NS

a and b: Means within the same row with different superscripts are significantly different (P<0.05). NS= Not significant, , =P<0.05.

[1]Dietary treatment groups; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO.

[2]Edible parts wt.= Empty carcass wt. (with head) + Edible giblets wt.

[3]Dressing % = (Total edible parts wt. / Pre-slaughter wt.) *100.

[4]Edible giblets = Liver +Kidneys +Heart weights

On the line, **Torbatinejad and Sherlock (2008)** showed that fat score of sheep fed on ration containing PO (T_1) was lower (P>0.05) than that fed two other level rations (T_2 and T_3). Internal organs (heart, kidneys, and liver) did not exhibit any symptoms of toxicity and seemed to be of normal size. These results indicate that using PO up to 22.5 % had not harmful effect on carcass traits and internal organs. These results agree with **Bakr *et al*. (2023),** who found that carcass traits of rabbits fed diets containing 10% sea grass (*Cymondocea nedosa*) did not differ when compared to that of the control diet.

Some blood metabolites:

Serum glucose:

Results showed in Table 8 found that dietary treatments had no effect (P>0.05) on serum glucose. However, means tented to be numerically decreased in rabbits fed on sea grass (PO) as compared to CON diet. Similarly, **Castillo *et al*. (2017)** found that serum glucose did not affect by inclusion PO up to 30% in ewes' ration. Whereas, glucose level of ewes that received 60 % of PO as a fodder source was lower than that received control ration or the lowest levels of PO (15 and 30%). These results were due to the decrease in dry matter intake.

Liver fractions:

Total protein, globulin and Alb./Glo. values did not significantly (P>0.05) affected by dietary treatments. Albumin value was lower (P<0.05) in SGR1 (7.5 %) than CON group, but did not differ significantly as compared to other dietary treatment groups (SGR2 and SGR3) as shown in Table 8. Similarly, **Castillo *et al*. (2017)** showed that total protein and albumin values did not differ significantly results of feeding sheep varying levels of PO. Values obtained fall within the normal range recommended. The above-mentioned values for total proteins, albumin and globulin indicate the efficiency of liver function and the efficiency of metabolism of feed proteins, as well as the safety and balance of the feeds containing PO when compared to the standard feeds containing alfalfa hay. Though, **Abdel-Samee (1995 & 1997) and Onifade and Tewe (1993)** revealed that the amount and quality of protein consumed generally affects total protein, albumin and globulin**.**

Liver functions:

When evaluating liver function, the activities of AST and GGT are taken together because they may be pertinent when providing new nutritional supplements to animals **(Castillo *et al*., 2012).** It is clear that increasing PO levels in the rabbit diets affect significantly on ALT enzyme, however SGR3 (22.5% PO) group had higher value (P<0.05) than the other groups (CON, SGR1 and SGR2). Mean of serum ALT were 47.75, 47.25, 49.25 and 61.00 U/L for CON, SGR1, SGR2 and SGR3 groups, respectively. Serum AST was lower (P<0.05) in SGR2 group than CON and SGR1 groups, but did not differ significantly with SGR3 group. The fact that both enzymes stayed within the rabbit's physiological range suggests that adding PO to the diet had no negatively impact the health of the rabbits. Similarly, **Castillo *et al*. (2017)** reported that PO inclusion up to 60 % in ewes' rations did not affect significantly on hebetic function (AST and GGT) enzymes.

Kidney functions:

Serum U-Nitrogen has long been known to be indicator of protein status. The U-Nitrogen concentration in SGR1 group was lower (P<0.05) than in SGR2 and SGR3 groups, but was comparable with those of CON group. Mean of serum U-Nitrogen were 40.00, 36.25, 41.25 and 41.75 mg /dl for CON, SGR1, SGR2 and SGR3, respectively. No significant differences among dietary treatment.

Table 8. Serum biochemical changes of growing rabbits as influenced by dietary treatments (X±SE) at 14 weeks of age.

Items	Dietary treatment groups[1]				Sig. test
	CON	SGR1	SGR2	SGR3	
Glucose (mg/ dl)	125.0 ±6.22	120.3 ±5.85	122.3 ±3.84	119.0 ±2.68	NS
Liver fractions					
TP (g/dl)	6.650 ±0.16	6.43 ±0.46	6.50 ±0.15	6.40 ±0.27	NS
Albumin(g/dl)	4.250^{a} ±0.12	3.33^{b} ±0.40	3.90^{ba} ±0.19	4.13^{ba} ±0.28	*
Globulin (g/ dl)	2.400 ±0.23	3.10 ±0.46	2.60 ±0.27	2.27 ±0.28	NS
Alb./Glo. (Ratio)	1.827 ±0.20	1.17 ±0.23	1.57 ±0.23	1.92 ±0.31	NS
Liver functions					
ALT (U/L)	47.75^{b} ±1.65	47.25^{b} ±0.63	49.25^{b} ±3.68	61.00^{a} ±3.72	*
AST (U/L)	31.75^{a} ±1.84	33.50^{a} ±2.33	26.25^{b} ±0.48	30.75^{ab} ±0.48	*
ALT/AST (Ratio)	0.668^{a} ±0.05	0.71^{ab} ±0.05	0.54^{bc} ±0.04	0.51^{c} ±0.03	*
Kidney functions					
Creatinine (mg.) /dl)	1.168 ±0.06	1.24 ±0.12	1.22 ±0.08	1.18 ±0.04	NS
Urea-N (mg /dl)	40.00^{ab} ±1.58	36.25^{b} ±0.85	41.25^{a} ±1.25	41.75^{a} ±1.65	*
Urea-N /Creatinine (Ratio)	34.56 ±2.28	30.41 ±3.78	34.22 ±2.27	35.37 ±1.40	NS

*a, b and c: Means within the same row with different superscripts are significantly different (P<0.05).
NS= Not significant,* =P<0.05.
[1]Dietary treatment groups; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO.

groups in creatinine concentration and Urea-Nitrogen /Creatinine (Ratio). Serum U-Nitrogen and creatinine values of All animals were within the standard range recommended for clinical healthy rabbits **(Manning *et al*., 1994).** In the same trend, **Castillo *et al*. (2017**) found that no significant differences in kidney function (SUN and creatinine) in sheep fed rations containing different levels of PO (15, 30 and 60 %) replacing barely straw and control rations.

The present results showed that all serum parameters were in the normal range of growing rabbits (**Abdel-Samee, 1995 & 1997; Abdel-Samee *et al*., 2003 & 2014 and Daader *et al*., 2016**). This explained that nutrients and dietary protein of diets were adequate and well utilized by rabbits. The blood components measured in this study indicate that the rabbits were in good health and the feed provided was sufficient and balanced with the nutrients required for production. This indicates the suitability of using Po in rabbit nutrition. The study also indicates that feeding on PO has no negative effect on either liver or kidney functions and that both work with high efficiency. Therefore, PO can be used up to 22.5% replacement of alfalfa hay in rabbits' diets without any harmful effect on most of the selected serum constituents.

Economic efficiency

It is clear that the low of the price of PO was reflected on the price of the tested diets. Feed cost / kg gain of the diet contains 22.5% PO was decreased in comparison with the other tested diets. Economic efficiency (E. E) % and relative E.E of SGR3 were the best followed by those of SGR2. While, those of SGR1 were the lowest as shown in Table 9.

Table 9. Economic efficiency of growing NZW rabbits fed diets containing different levels of *Posidonia oceanica*, under North Sinai conditions at 14 weeks of age.

Items	**Dietary treatment groups***			
	CON	**SGR1**	**SGR2**	**SGR3**
Total feed intake/kg	5.93	5.76	5.71	5.75
Price/kg diet	7.57	7.30	7.02	6.74
Total feed cost /rabbit (L.E)	44.89	42.05	40.08	38.76
Total gain/rabbit (Kg)	1.64	1.52	1.50	1.50
Feed cost/ Kg gain	27.37	27.66	26.72	25.84
Price/Kg B.W.	50	50	50	50
Total return / rabbit (L.E)	82.00	76.00	75.00	75.00
Net return/ rabbit (L.E)	37.11	33..95	34.92	36.24
Economic efficiency (E.E) %	82.67	80.74	87.12	93.50
Relative E.E %	**100**	**97.67**	**105.38**	**113.10**

*Dietary treatment groups; CON = Basal diet containing zero PO, SGR1= Basal diet containing 7.5% PO, SGR2= Basal diet containing 15% PO, and SGR3 =Basal diet containing 22.5% PO.

CONCOLOSION

It could be concluded that dried *Posidonia oceanica* can be used up to 22.5% as replacement of alfalfa hay in rabbits' diets without any harmful effects on growth performance, health status and economic efficiency under North Sinai conditions.

REFERENCES

A.O.A.C. (2012) Association of Official Analytical Chemists. *Official Methods of Analysis*: (19th edition). Washington, DC, USA

Abd-Allah, M. S. M. (2017). Productive performance of rabbits fed Moringa oleifera M. Sc. Thesis, Fac. of Technology and Development, Zagazig University, Egypt.

Abdel-Razik, M. A.; AbdeI-Samee, A. M.; Nowar, M. E. and Nada, T. M. (1999). Productive traits and some related physiological and histological parameters as influenced by drinking agriculture drainage water in New Zealand White and Californian rabbits. 1st Inter. Conf. on Indigenous versus Acclimatized Rabbits. Fac. of Environ. Agri. Sci., Suez Canal University, EI-Arish, North Sinai, Egypt, Abdel-Samee *et al.* "edit." 7-9 September 1999. pp:313-325.

Abdel-Samee, A. M. (1995). Using some antibiotics and probiotics for alleviating heat stress on growing and doe rabbits in Egypt. *World Rabbit Science*, 3(3): 107-111.

Abdel-Samee, A. M. (1997). Response of New Zealand White rabbits to thermal stress and its amelioration during winter and summer of North Sinai. *Egypt. Journal of Arid Environments*, 36(2): 333-342.

Abdel-Samee, A. M.; Ali, A. M.; Mousa, M. R. M. and Abdel-Ghaffar, M. A. (2003). Performance of heat stressed New Zealand White (NZW) growing rabbits in subtropics. In Proc.: 9th Conf. on Animal Nutrition (*Ruminants, Poultry, Rabbit and Fish Nutrition*): 14-17.

Abdel-Samee, A. M.; Tantawy, H. M. and Rashed, R. M. (2014). Heat adaptability of growing New Zealand White rabbits under Egyptian conditions. *Zagazig Veterinary Journal*, 42(1):140-151.

Abdel-Samee, A.M.; Tantawy H.M. and Rashed, R.M. (2017). Effect of some medicinal plants on semen traits of New Zealand White rabbits during summer season. *Egypt. of Appl. Sci*., 32 (7): 49-62.

Augier, H. and Santimore, M. (1979). A chemical study of *Posidonia oceanica*, composition of ashes, CHN, proteins and amino acid. *Trav Sci Parc Natl Port-Cros* 5: 105–123.

Bakr, E. O. A.; Amer, W.; Mousa, M. and Shetaewi, M. (2023). Effect of using some sea-grass (*cymodocea nodosa*) and vegetable crop residues as untraditional feeds in growing rabbits diet on growth performance under North Sinai conditions. *Egyptian Journal of Rabbit Science*, 33(2: 85-103.

Bakr, E. O. A.; Galal, H. M. F. and Abbas, H. (2021). Nutritional evaluation of dried tomato (*lycoprison esculintum*) haulms instead of alfalfa hay in feeding growing rabbits under north Sinai conditions. *Egyptian Journal of Nutrition and Feeds*, 24(2): 55-63.

Bakr, E. O. A.; Shetaewi, M. M. and El-Desoky, A. E. M. I. (2019). Effect of olive cake pulp as a partial or a complete substitute of wheat bran in growing rabbits' diet on growth performance, carcass traits and blood constituents under North Sinai conditions. *Journal of Animal and Poultry Production*, 10(3): 83-88.

Boudouresque, C. F.; Mayot, N. and Pergent, G. (2006). The outstanding traits of the functioning of the *Posidonia oceanica* seagrass ecosystem. Biologia marina mediterranea, 13(4): 109-113.

Castillo, C.; Hernandez, J.; Pereira, V. and Benedito, J.L. (2012). Update about nutritional strategies in feedlot for preventing ruminal acidosis, in Advances in Zoology Research, Vol. 4, ed. by Jenkins OP. Nova Science Publishers, New York, NY, pp. 1–84.

Castillo, C.; Hernández, J.; Sotillo Mesanza, J.; Gutiérrez, C.; Montes, A. M. and Mantecón, Á. R. (2017). Effects of *Posidonia oceanica* banquettes on intake, digestibility, nitrogen balance and metabolic profiles in sheep. *Journal Science of Food and Agriculture*, 98(7): 2658-2664.

Castillo, C.; Mantecón, A. R.; Sotillo, J.; Benedito, J. L.; Abuelo, A.; Gutiérrez, C. and Hernández, J. (2014). The use of banquettes of *Posidonia oceanica* as a source of fiber and minerals in ruminant nutrition. *An observational study. Animal*, 8(10): 1663-1666.

Castillo, C.; Mantecón, A. R.; Sotillo, J.; Gutiérrez, C.; Abuelo, A. and Hernández, J. (2015). *Posidonia oceanica* banquettes as a substitute for straw in dairy goat rations: metabolic and productive effects. *Journal Science of Food and Agriculture*, 96(2): 602-609.

Cheeke, P. R. (1986). Potentials of rabbit production in tropical and subtropical agricultural systems. *Journal of Animal Science*, 63(5): 1581-1586.

Cheeke, P. R. (1987). *Rabbit feeding and nutrition*. Academic press. Ozlanda, Florida, U.S.A.

Cheeke, P. R.; Patton, N. and Templton, G. S. (1982). *Rabbit Production*. 5th Ed. The Interstate Printers and piblishers Inc., Danville. IIIinois, USA.

Daader, A. H.; Yousef, M. K.; Abdel-Samee, A. M. and Abd El-Nour, S. A. (2016). Recent trends in rabbit does reproductive management: special reference to hot regions. *In Proceedings 1th World Rabbit Congress* 149-166.

Davis, P. H. (1984). *Flora of Turkey and the East Aegean Islands*. Edinburgh, Edinburgh University Press, pp. 8–34.

De Bruyne, T.; Pieters, L.; Deelstra, H. and Vlietinck, A. (1999). Condensed vegetable tannins: biodiversity in structure and biological activities. *Biochemical Systematics and Ecology*, 27(4): 445-459.

Dei, H. K.; Rose, S. P. and Mackenzie, A. M. (2007). Shea nut (*Vitellaria paradoxa*) meal as a feed ingredient for poultry. *World's Poultry Science Journal*, 63(4): 611-624.

Doumas, B. T.; Watson, W. A. and Biggs, H. G. (1971). Albumin standards and the measurement of serum albumin with bromocresol green. *Clinica Chimica Acta*, 31(1): 87-96.

Duncan, D. B. (1955). Multiple range and multiple F tests. *Biometrics*, 11(1): 1-42.

El-Kerdawy, D. M. A. (1997). Olive pulp as a new energy source for growing rabbits. *Egyptian Journal of Rabbits Science* 7 (1):1-12.

Elsaied, H. E.; Hassaan, M. and Taleb, H. T. A. (2015). Genetic and nutritional characterization of some macrophytes, inhabiting the Bardawil Lagoon, Sinai, Egypt. *The Egyptian Journal of Aquatic Research,* 41(4): 315-322.

Gu, Z. L. (2002). Modern Rex rabbit production. Hebei Science and Technology press, Shigia Zhuang, China.

Henry, R. J. and Canmon, D.C. and Winkelman, J. W. (1974). *Principles and Techniques*, Harper and Row. *Clinical Chemistry*., P.415.

Husdan, H. and A. Rapoport (1968). Estimation of creatinine by the Jaffe reaction. Acomparison of three methods. *Clin. Chemist.*, 14:222-238.

Invers, O.; Kraemer, G. P.; Pérez, M. and Romero, J. (2004). Effects of nitrogen addition on nitrogen metabolism and carbon reserves in the temperate seagrass *Posidonia oceanica*. *Journal of Experimental Marine Biology and Ecology*, 303(1): 97-114.

Khadr, N. A. and Abdel-Fattah, F.A.I. (2008). Tomato waste as an unusual feedstuff for rabbit. 1- Response of growing rabbits to diets containing tomato waste, *Zag. Vet. J.* 36, (1): 29-48.

Khayyal, A. A.; Bakr, E. O. A.; Phillip, Y. L.; Hussein, A. M. and Khir, A. A. (2017). Effect of diets containing dried taro (*Colocasia esculanta*) waste and dried yeast (*Saccharomyces cerevisiae*) on performance of growing rabbits. *Journal of Animal and Poultry Production*, 8(6): 109-117.

Manning, P. J.; Ringler D. H. and New comer C. E. (1994). *The Biology of Laboratory Rabbit*, 2nd ed. Academic press inc., San Diego, California, USA.

Micheli, L.; Vasarri, M.; Barletta, E.; Lucarini, E.; Ghelardini, C.; Degl'Innocenti, D. and Di Cesare Mannelli, L. (2021). Efficacy of *Posidonia oceanica* extract against inflammatory pain: *in vivo* studies in mice. *Marine Drugs*, 19(2): 48.

Nihal, G. Shams El Din and Zeinab, M. El-Sherif (2013). Nutritional value of *Cymodocea nodosa* and *Posidonia oceanica* along the western Egyptian Mediterranean coast. *The Egyptian Journal of Aquatic Research*, 39(3), 153-165.

North, M. O. (1981). *Commercial Chicken Production manual*. 3rd Ed, Avi., Publishing Company. I.N.C. Westport Connecticut, USA.

NRC (1977). **National Research Council.** *Nutrient Requirements of Domestic Animals, Nutrient Requirements of Rabbits,* 2nd ed. National Research Council, National Academy of Science. Washington, DC. USA.

Onifade, A. and Tewe, O. O. (1993). Alternative tropical energy feed resources in rabbit diets: growth performance, diet's digestibility and blood composition. *World Rabbit Science*, 1(1).

Reitman, S. and Franke, S. (1957). A colorimetric method for the determination of serum glutamic oxalacetic and glutamic pyruvic transaminases. Am. J. Clinical Pathology. (28):56–63.

SAS Institute Inc., (2004). SAS *Procedures Guide For Personal Computers, Statistical Analysis System Institute*, Inc., Cary, N. C.

Schalm, O. W.; Jain, N. C. and Carrol, E. (1975). *Veterinary Haematology.* 3rd Edition Lea and Febiger. Philadelphia USA, 160-210.

Shiemann, R.; Nehring K.; Hoffman L.; Jentsch W. and Chudy A. (1972). Energetische futterbewertung und energienormen. VEB Deutscher Landwritschaftsveriag. Berlin. 344.

Sica, D.; Piccialli, V. and Masullo, A. (1984). Configuration at C-24 of sterols from the marine phanerogames *Posidonia oceanica* and *Cymodocea nodosa*. *Phytochemistry*, 23(11): 2609-2611.

Snedecor, G. W. and W. G. Cochran. (1982). *Statistical Methods*. 2nd Ed. Iowa University, Press Ames, Iowa, USA.

Torbatinejad, N. and Sherlock, R. G. (2008). Comparison of feeding value of a treated sea plant, *Posidonia australis*, with lucerne, pasture and wheat. *International Journal of Plant Production*, 2(1): 47-56.

Torbatinejad, N. M.; Annison, G.; Rutherfurd-Markwick, K. and Sabine, J. R. (2007). Structural constituents of the seagrass *Posidonia australis*. *Journal of Agricultural and Food Chemistry*, 55(10): 4021-4026.

Viso, A. C.; Pesando, D.; Bernard, P. and Marty, J. C. (1993). Lipid components of the Mediterranean sea grass *Posidonia oceanica*. *Phytochemistry*, 34(2): 381-387.

أداء النمو وبعض التغيرات الكيميائية الحيوية في الدم لدى الأرانب النامية تحت تأثير التغذية بمستويات مختلفة من عشبة البحر المجففة (البوسيدونيا اوشينيكا) في ظل ظروف شمال سيناء

السيد عثمان عبد النبي بكر، اسراء جمال شلبي، محمد رضا موسى، عبد الشافي محمد عبد السميع

قسم إنتاج الحيوان والدواجن، كلية علوم البيئة والزراعة، جامعة العريش، العريش، شمال سيناء، مصر.

هدفت الدراسة الى استخدام الأعشاب البحرية الجافة (بوسيدونيا اوشينيكا) كعلف غير تقليدي بديلاً لدريس البرسيم الحجازي في علائق الارانب النامية. وكذلك الحفاظ على الاتزان البيئي ومنع التلوث والتخلص من هذه المخلفات البحرية

استخدم في الدراسة ثمانية واربعون ارنباً عمر ٦ أسابيع بمتوسط وزن ٧٤٩ جرام وزعت عشوائيا على ٤ مجاميع بكل مجموعة ١٢ ارنباً، المجموعة الاولى تغذت على عليقة أساسية (CON) خالية من البوسيدونيا بينما المجموعات الثلاثة الاخرى SGR3، SGR1،SGR2 تغذت على علائق تحتوي على % ٢٢.٥، ١٥، ٧.٥ بوسيدونيا اوشينيكا جافة استبدالا من دريس البرسيم الحجازي. وفي نهاية التجربة أجريت تجربة هضم لتقدير معاملات هضم المركبات الغذائية والقيمة الغذائية للعلائق التجريبية. وايضا اختيرت أربع ارانب من كل مجموعة لذبحها لتقدير صفات الذبيحة وبعض مكونات الدم.

أوضحت النتائج المتحصل عليها

- التغذية على البوسيدونيا اوشينيكا حتى مستوى ٢٢.٥% لم يؤثر على خصائص النمو مثل وزن الجسم الحي والزيادة الوزنية الكلية ومعدل النمو اليومي وسرعة النمو النسبية ودليل النمو وكذلك المأكول الكلي واليومي ومعدل الكفاءة التحويلية عند الاعمار المختلفة للأرانب (٦ -١٤ أسبوع).
- تأثرت الحيوية بزيادة مستوى إضافة البوسيدونيا اوشينيكا في العليقة حيث كانت ٨٣.٣٣% للمجموعة الرابعة SGR3مقارنة ب ١٠٠% للمجاميع الثلاثة الأخرى.

- لم تتأثر معاملات هضم كلاً من المادة الجافة والبروتين والدهن بينما تأثر كلاً من معامل هضم المادة العضوية والكربوهيدرات الذائبة حيث كانت اعلى في عليقة الكنترول مقارنة بالعلائق المحتوية على البوسيدونيا اوشينيكا.
- قل معامل هضم الالياف معنويا بزيادة مستوي البوسيدونيا اوشينيكا في العليقة.
- تأثرت القيمة الغذائية للعلائق التجريبية (البروتين المهضوم% ومجموع المركبات الكلية المهضومة % والطاقة المهضومة) حيث قلت معنوياً بزيادة مستوى البوسيدونيا اوشينيكا في العليقة.
- لم يؤثر زيادة مستوى إضافة البوسيدونيا اوشينيكا على كل صفات الذبيحة فيماعدا دهن البطن حيث كان اقل معنويا في SGR1مقارنة بالكنترول.
- لم يؤثر زيادة مستوى إضافة البوسيدنيا اوشينيكا على معظم صفات الدم فيما عدا الالبيومين وانزيمات الكبد ALT&AST واليوريا حيث كان الالبيومين اعلى معنوياً في CON مقارنة ب SGR1.
- ALTكان اعلى معنوياً في SGR3مقارنة بالثلاث مجموعات الأخرى.
- مستوى اليوريا كان اقل معنويا في المجموعة SGR1مقارنة بال SGR2 & SGR3
- ازدادت الكفاءة الاقتصادية بزيادة مستوى البوسيدونيا اوشينيكا في العليقة حيث حققت المجموعة الرابعة اعلى كفاءة اقتصادية.
- واوصت الدراسة بانه يمكن استخدام الأعشاب البحرية الجافة (بوسيدونيا اوشينيكا) حتى مستوى ٢٢.٥% كبديل لدريس البرسيم الحجازي بدون ان يؤثر ذلك على صفات النمو والحالة الصحية والكفاءة الاقتصادية للأرانب. حيث اوضحت النتائج عدم وجود فروق معنوية بين مجموعة المقارنة وباقي المجاميع التجريبية في معظم صفات وخصائص النمو .
- **التوصية:** يمكن استنتاج امكانية استبدال البوسيدونيا اوشينيكا حتى نسبة ٢٢.٥% بدلا من دريس البرسيم الغالي الثمن في علائق الارانب من بعد الفطام مما يترتب علية زيادة الجدوى الاقتصادية وتقليل تكلفة انتاج كيلو اللحم في مزارع انتاج الارانب.