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Impacts of Pomegranate Peel Supplementation to Baladi Crossbred Heifers Rations on Nutrients Digestion, Growth Rate, Some Blood Parameters, Antioxidant Status and Economic Efficiency

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Abstract

THIS study was conducted to investigate the effects of dried pomegranate peel (DPP) supplementation on growth performance, feed intake, nutrient digestibility, nutritive value, blood parameters, feed conversion ratio (FCR), and economic efficiency in growing Baladi crossbred heifer rations.In total30heifers with an average live weight of 201.74 ± 4.05 kg at the start of the experiment were randomly divided into 3 groups (10 each one). The animals received their rations with different levels of (DPP) (0, 100, and 200 g/h/d in G1, G2, and G3, respectively).The results showed that the values of digestion coefficients and nutritive value were not significantly (P>0.05) affected, except that CP digestibility was significantly higher (P< 0.05) in G2 than in G1 and G3.The blood parameters of the experimental heifers were within the normal ranges for ALT, AST, cholesterol, triglyceride, urea, creatinine, albumin, and total protein without any significant variations (P> 0.05).Otherwise, total antioxidant capacity (TAC), phagocytic index, lymphocyte transformation and glutathione assay were significantly increased in G2 and G3 compared with G1(control).Final BW, total BW gain and ADG, were not considerably impacted by the treatments(P> 0.05). A positive effect on the economic feed efficiency was found, besides improving FCR and reducing feeding cost for 1 kg weight gain, it could be concluded that the addition of 100 and 200 g DPP/h/d might be a good strategy to improve the growth performance, immunity, antioxidative status, and profitability of livestock farms.

Keywords: Nutrient digestibility, pomegranate peel, ruminants' immunity, antioxidants, economic efficiency.

Introduction

With the increasing demand for animal-origin products (i.e., meat and milk) and rising feed prices, it was necessary to search for non-conventional feedstuffs that can improve nutrient utilization and subsequently enhance animal performance[1–2]. For A high content of many bioactive compounds that can directly and positively affect animal health and performance. Pomegranate by-products are considered promising alternative ingredients for animal rations.

Pomegranate is scientifically known as *Punicagranatum* L. that belongs to the Punicaceae family and considered an important edible fruit in most parts of the world [3]. Otherwise, the cultivation of pomegranate covers 835,950 hectares worldwide, producing 8.1 million tons of fruit [4]. Furthermore, a substantial amount of pomegranate by-products such as pulp or peel becomes available after juice processing[5]. [6] reported that the average weight of pomegranate fruit consists of about 50% inedible parts, while the remaining half includes 20 and 80% seeds and juice, respectively. Agro-industrial by-products in livestock feeding have received significant attention[7], which convert low-value by-products into nutritious high-value feed, helping to meet population growth needs. Moreover, it reduces environmental pollution, and waste disposal costs In addition, adopting the recycling of agricultural by-products has lessened the severe feed shortage that developing countries face and lowers

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feeding costs, which raises the profitability of animal production projects[10–11]. As mentioned before, pomegranate peel has high contents of bioactive compounds (secondary metabolites) such as phenolic compounds, flavonoids, tannins, proanthocyanidins, and ascorbic acid. These compounds have a variety of beneficial properties, including antioxidant, anti-inflammatory, antibacterial, and antiviral activity [12–13]. One of these bioactive compounds is “Tannins” Because they can form complexes with proteins, these phenolic compounds have been demonstrated to decrease the degradation of ruminal proteins. [14–15] Furthermore At a pH of 6-7 in the rumen, tannins can form protein bonds that inhibit bacterial proteolysis. However, at a pH of 3–4, the bonds break, releasing amino acids and increasing protein utilization while lowering rumen ammonia levels. Additionally, the small intestine's absorption of essential amino acids rose[16–17]. Several studies have investigated the antioxidant and phenolic properties of pomegranate peel. According to [18]. beef calves fed concentrated pomegranate peel extract (PPE) at 3-4% of ration(as dry matter -DM-) had antioxidative status than the control group. Moreover [19]. declared that feeding animals with pomegranate peels increased their growth rates. This is possibly due to improvement of immune functions. Likewise [20]. noted that lambs fed liquid PPE up to 45 mL/kg of ration as DM had blood analysis characterized by great antioxidative capacity and improved animal growth [13]. revealed that pomegranate peel, fed at a level of 20% dietary DM, is safe for dairy cows, and it improved cow productivity and reduced feed costs, leading to increased economic efficiency and net revenue

This study's objective was to examine the impact of using pomegranate peels as a feed supplement in Baldi cross-bred heifers’rations regarding nutrients’ digestibility, The feed conversion ratio (FCR), average daily gain (ADG), certain blood parameters, and economic efficiency.

Material and Methods

This study was accomplished in a private farm (Bonita Cattle Farm at the Cairo-Alexandria Desert Road, kilo 58, Egypt). In the laboratories of the Department of Animal Production and Cairo University Research Park (PURP), Faculty of Agriculture, Cairo University, Egypt, feeds, excrement, and blood samples were chemically analyzed.

Animals, rations and experimental design

Thirty Baladi cross-bred heifers with an average bodyweight of 201.74 ± 4.05 kg Initially, the experiment was split into 3 comparable groups at random. (10each). The animals were kept in an open-house system for the duration of the experiment. Free availability of drinking water and mineral blocks during the day. The experimental concentrate feed mixture (CFM; 6 kg) and roughages (4.5 kg): rice straw (1.5 kg) and parsley hay (3 kg) were offered in total mixed ration (TMR) At 5:00 am, 1:00 pm, and 9:00 pm, three times a day.

The average daily weight gain was monthly recorded before morning feeding diet. The dried pomegranate peels (DPP) were obtained from a fruit factory (Juhayna, 6th of October city, Giza, Egypt) and sun dried, grinded and then supplemented to the rations. The three groups were fed the same ration with an approximate roughage to concentrate ratio(R:C) 44: 56 on DM basis. The CFM consisted of yellow corn grains,bakery by-products, wheat bran, clover seed meal,date by-products, soybean meal 44%, limestone, salt, sodium bicarbonate, magnesium oxide, vitamins and minerals premixand toxin binder as shown in Table (1).

Table (2) displays the chemical composition on DM basis for the experimental CFM, parsley hay, rice straw, and the experimental ration based on the roughage to concentrate ratio (44:56) the experimental groups were individually fed the same TMR. The control group received TMR without any DPP supplement, while the experimental animals in the second (G2) and third group (G3) received 100 and 200 g/head per day of DPP, respectively. The experimental trail lasted for 120 days including 21 days of adaptation; in the 1st week, animals of G2 and G3 received 50 g of DPP /h/d; in the 2nd week, animals of G2 and G3 received 100 g of DPP /h/d;in the 3rd week, animals of G2 received 100 g and G3 received 200 g of DPP /h/d.

Feeds and feces analysis

The CFM, DPP,rice straw, parsley hay and feces were analyzed for DM, OM, ether extract (EE), crude protein (CP) and crude fiber (CF) according to the methods of [22] . The following is the DM basis for the calculations of nitrogen free extract (NFE) and organic matter (OM):

NFE % = 100 – (%CP + % CF + % EE +% Ash)
OM= % CP + % CF + % EE + % NFE).

Digestion trial and feces sampling

Five animals per group had their individual faeces samples collected during the final week of the experiment.to perform a digestion assessment. Feces samples were taken from the rectum of the animal twice a day, (in the morning and evening,) for 3consecutive days, mixed (6 samples per animal) and then stored in deep freezing (-18 °C) before the analysis. At 60°C,samples were dried for 72h, grounded to pass through a 1-mm screen and then kept in polyethylene bags for chemical analysis. The method that was applied to determine digestibility of nutrients is acid insoluble ash (AIA), as an internal marker, according to the following the equations of [23]. as follow:

Dry matter digestibility (DMD) = $(100-(\frac{Marker\%\ In\ fead}{Marker\%\ In\ feces})\times 100)$.

$Y=100-(\frac{N}{M})\times(100\text{-DMD})$,

where,Y= % nutrient digestibility; N= nutrient% in feces; M = nutrient% in feed.

Furthermore, the nutritional value of rations, expressed as total digestible nutrients (TDN) and digestible CP, was estimated according to[24] formula:TDN (%) = [Digestible CF (%) + Digestible CP (%) + (Digestible EE (%) × 2.25) + Digestible NFE (%)].

Blood sampling and analysis:

Blood samples were collected from jugular vein at the conclusion of each group's five animals' digestive trails They were collected in clean tubes containing heparin at 4 h after morning feeding.

The colorimetric method was used to determine the lymphocyte transformation test. [25]. Blood film was prepared according to [26] the percentage and absolute value for each type of cells were calculated according to [27] while phagocytic activity was determined according to[28] The blood samples were left to clot and then centrifuged at 3000 rpm /10 minutes after that serum was separated in clean Eppendorf tubes by using plastic pipette, finally serum samples were kept at-20^{o}C until tested. The Jenway 6300 Spectrophotometer U.K. was used to perform calorimetric measurements of plasma alanine transaminase (ALT) and aspartate transaminase (AST) activity in order to identify additional blood constituents.[29] Creatinine was determined according to[30] Triglycerides and cholesterol were measured in accordance with [31] Measurements of total protein and albumin were made using [32] and[33]respectively. Urea concentration was measured as described by[34] The Stat Lab szsl60-Spectrum device was used to measure total antioxidant capacity (TAC), a type of antioxidant biomarker, in accordance with [35].

Statistical analysis

Data were analyzed using one way ANOVA and the model used for analysis was:

$Y_{ij}=\mu+T_i+\mathcal{E}_{ij}$,

where: Yij= experimental observation; µ = general mean of treatments; Ti = effect of treatment; eij = experimental error

Duncan's multiple range test was used to compare treatment means [36].

Results and Discussion

Digestibility and nutritive values

Nutritive values and digestion coefficients for the experimental rations containing DPP, such as digestible CP and TDN at levels of 0, 100 and 200 g/ h/d in G1, G2 and G3, respectively,are shown in Table 3. No significant differences were found among the experimental groups for digestibility of DM, OM, CF, EE, NFE as well as TDN (*P*> 0.05). Moreover, there was an insignificant difference in the CP digestibility between G1 and G3 (46.86*vs* 48.92%, respectively; *P*> 0.05), however, the CP digestibility was significantly higher (*P*< 0.05)in G2 compared to G1 and G3.Similarly, digestible CP was found to be higher (*P*< 0.05) in G2 compared to G1 and G3. Numerically, the higher digestibility of CP, CF, and NFE in G2 can be related to the low concentration of tannin in the diet that might improve production efficiency compared with the third group (G3), by dietary protein protection from ruminal microflora attack due to the binding of tannins to dietary protein [37-1] These results agreed with[19] who found that CP and NFE digestibility was significantly (*P*< 0.05) higher in lambs fed 1% DPP compared to the control group. Also[5] demonstrated that giving dairy cows 1-4% pomegranate peel extract enhanced their CP, NDF intake, and digestibility. On contrast[38] noted a reduction in the digestibility of DM, OM, and CP, when DPP was included into the diet compared to the control one.

Blood parameter

According to[39]blood metabolite concentrations serve as an integrated indicators of how animals are well supplied with nutrients. Furthermore [40] supported this point of view declaring that the values of various blood variables in growing ruminants are significantly impacted by their feeding and rearing system.

Resultsin Table 4, indicated that DPP had no significant effects on the ALT,ASTcholesterol, triglyceride,urea,creatinine, albumin, total protein.In the same trend, the addition of different PPE levels in the diet of fattening lambs had no effect on blood metabolites according to[20] Likewise, [41] reported similar results revealing no notable variations in the levels of albumin, triglycerides, and total protein in the blood of lactating Holstein cows when PPE was applied to their rations.

The results supported that adding DPP to the heifers ‘rations had a positive effect on the immune system response. It was noticed that DPP significantly increased in phagocytic index G2 and G3 compared with G1 (*P*<0.05).Phagocytic index measures the immune system's ability to identify pathogens, Moreover, lymphocyte transformation also significantly increased (*P*<0.05) in G2 and G3 compared with G1.According to[42] the previous findings support the great enhancement in the immune system response.

Interestingly, DPP inclusion in diets increased TAC in G3 and G2 more than the control group. This is might be high percentage of antioxidant compounds such as water-soluble polyphenols, anthocyanins, and hydrolyzed tannins[43–44–45].In agreement with[20] who found that lambs fed dietary PPE had higher antioxidative capacity than those fed a PPE-free diet. In the same context, according to[18] Holstein calves fed concentrated PPE (3%–4% of diet DM) had higher blood antioxidative capacity than calves fed a PPE-free diet[46] found that feeding lambs pomegranate byproduct silage at up to 240 g/kg of DM raised the amount of TAC in their meat. which indicates that including DPP into ruminant diets might have a desirable impact on final products (meat and milk)

Besides, the results displayed in Table 4 showed that there was a significant effect on the glutathione assay ($P< 0.05$) in G2 and G3 compared with the control group (G1). This may be due to the presence of active compounds, flavonoids, phenols, proanthocyanidins, and triterpenes, which strongly support the markable enhancement inanimal antioxidative status Through the indirect stimulation of glutathione production in the body [47] It is worth mentioning that glutathioneis an important antioxidant factor, and its intracellular concentration indicates oxidative stress[48] as it is mainly affected by liver function and energy metabolism[49] These findings suggest that using DPP during the critical periods for animals (e.g., heat stress, transporting, vaccination, etc.) might be a good strategy to alleviate stresses and improve animal health[50–51]

Growth performance and feed intake

In this study Initial body weight (BW), final BW, total BW gain and ADG, were not considerably impacted by the treatments.($P> 0.05$), as presented in Table 5.However, there was a mathematical improvement in growth parameters that can be attributed to the addition of low levels of DPP due to tannin's protective property against ruminal protein degradation[52] In agreement with[53] the addition of DPP to the concentrate diet of Awassi lambs had no significant effect on weight gain. Incontrast [19] discovered that the inclusion of pomegranate peel in the diets of Karadi lambs increased their weight gain. The inclusion of DPP in the heifers‘diethad no adverse effect on DM intake. These results are consistent with [17] who found that pomegranate peel added to ruminant diets at 200 or 250 g DM levels had no effect on the amount of DM consumed.

Meanwhile, [54] noticed that feeding pomegranate extract to young calves for the first 70 days of life reduced grain intake and BW gain, most likely due to the high tannin content. However, according to [55] dietary pomegranate peels increased DM intake and tended to increase BW gain in beef cattle. Likely, because tannins have both negative and positive effects in ruminants [56] the results of this study revealed that DPP levels had no negative effects on feed conversion ratio (FCR), as heifers fed 200 g/d DPP (G3) consumed their diet more efficiently than G1 and G2.The reduction in feed intake and digestibility is simply due to the high polyphenol and lignin content of some by-products [7]. The economic efficiency of experimental heifers fed rations containing DPP is shown in Table 5.Results showed that feed cost to gain 1 kg live BW was numerically decreased in both treated groups (G2 and G3) compared with the control group(90.78,87.22 and 93.20 LE/1 kg weight gain, respectively This was reflected in the expected daily income and relative economic efficiency that were increased by9 and 22% in G2 and G3, respectively, compared with the control.The present data are consistent with those obtained by[57] who evaluated replacing1% yellow corn with DPP in the diets of Osimi lambs, and he observed an increase in daily income and a decrease in feed costs (pounds per kg gain). An enhancement in the relative economic efficiency was also recorded by[58] who found that substituting feed blocks containing waste fruits for 35% of concentrate in lactating goat diets decreased the cost of animal feeding.

Conclusion

The inclusion of DPP 100 or 200 g/h/d in the growing heifer diets is recommended for the improving CP digestibility, immunity parameters and antioxidative status. This enhanced the animals' immunity due to the presence of antioxidant components, and it can be used safely without any negative impacts on nutrient digestion, growth performance, or blood indicators, in addition it had a positive impact on relative economic efficiency.

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Declaration of Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical of approval

The experiment protocol was approved by the Institutional Animal Care and Use Committee, Cairo University (IACUC), Giza, Egypt(Approval No. CU/ II/F/54/23).

TABLE 1. Composition of the experimental concentrate feed mixture (CFM).

Ingredients (g/kg)	Item
Yellow corn grains	200
Bakery by-products	260
Wheat bran	150
Cloverseed meal	150
Date by-products	125
Soybean meal 44%	75
Limestone	18
Salt	10
Sodium bicarbonate	6
Magnesium oxide	2
Vitamins and minerals premix	3
Toxin Binder	1
Total	1000

TABLE2. The chemical makeup of rice straw, parsley hay, concentrate feed mixture, and the experimental ration (g/100 g DM, excluding GE)1.

	Feed ingredients			
Item (g, 100 g DM)	**CFM**	**Parsley hay**	**Rice Straw**	**TMR[2]**
OM	91.00	78.57	75.41	84.13
CP	14.22	14.78	5.35	10.31
CF	9.34	15.68	27.84	17.54
EE	7.01	3.03	1.58	4.62
NFE	60.34	45.08	40.64	51.66
GE (MJ/kg DM)[3]	20.49	16.33	13.67	18.32

* CFM:Concentrate feed mixture, [1] DM, dry matter; OM, organic matter; CP, crude protein; CF, crude fiber; EE, ether extract; NFE, nitrogen free extract.[2]Calculated. according to [21]formula: GE, growth energy. (MJ/kg DM) = [EE (g) × 39.50] + [CP (g) × 23.60] + [Carbohydrates (g) × 17.20].

TABLE3. Impact of adding pomegranate peels to the experimental rations on their nutritional value and digestibility

	Experimental groups				
Variable	**G1**	**G2**	**G3**	**± SEM**	***P*-value**
Digestion coefficient (%)					
DM	57.86	62.93	57.46	1.37	0.189
OM	65.02	69.93	64.14	3.30	0.255
CP	50.68[b]	61.14[a]	52.91[b]	1.94	0.028
CF	57.28	62.96	60.01	1.97	0.521
EE	80.51	78.10	84.97	1.88	0.372
NFE	68.79	73.92	67.86	1.58	0.252
Nutritive values (% DM basis)					
TDN	59.35	62.35	58.86	1.26	0.503
DCP	4.83[b]	6.30[a]	5.04[b]	0.25	0.016

*G1: control diet without DPP/h/d; G2 and G3: 100 and 200 g DPP/h/d respectively.DM: dry matter,OM: organic matter: crude protein, CF: crude fiber , EE: ether extract,NFE: nitrogen free extract ,TDN: total digestible nutrients, DCP: digestible crude protein.

TABLE4. Effect of dried pomegranate peel inclusion into heifers' diets on blood parameters and immune system response.

Variable	Experimental groups G1	G2	G3	± SEM	*P*-value
ALT (IU/ml)	29.00	33.40	30.60	.982	0.194
AST (IU/ml)	71.60	67.80	69.60	1.09	0.391
Cholesterol (mg/dl)	224.75	219.60	226.60	5.76	0.887
Triglyceride (mg/dl)	33.60	34.40	33.80	1.41	0.975
Urea (mg/dl)	20.60	22.00	23.60	0.77	0.303
Creatinine (mg/dl)	0.96	0.91	0.98	0.02	0.284
Albumin (g/dl)	3.59	3.79	3.78	0.05	0.199
Total Protein (g/dl)	6.23	6.89	6.85	0.15	0.142
Total antioxidant capacity (mm/l)	0.18[c]	0.70[b]	1.02[a]	0.09	<0.001
Phagocytic index	1.50[b]	2.02[a]	2.10[a]	0.08	<0.001
Lymphocyte transformation	29.00[b]	34.60[a]	35.00[a]	0.83	<0.001
Glutathione Assay	0.13[b]	0.40[a]	0.42[a]	0.04	<0.001

a,b, Means in the same row with various superscripts are different at (P<0.05). ALT,alanine transaminase; AST, aspartate transaminase. SEM = standard error of the mean.

TABLE5. Partial dried pomegranate peel (DPP) has an impact on average live body weight, feed intake, feed conversion ratio, and economic efficiency when added to fattening heifer meal plans.

Items	Experimental rations G1 Control	G2 100DPP	G3 200 DPP	SEM	*P*-value
Body weight change					
Initial live body weight, Kg	206.43	204.88	187.25	-	-
Final live body weight, Kg	278.86	279.63	265.50	-	-
Total live body weight gain, Kg	72.43	74.75	78.25	-	-
Average daily gain, g	0.85	0.88	0.92	0.027	0.681
Feed Intake					
Feed intake, As fed, Kg/h/d.	10.50	10.60	10.70	-	-
TMR (kg/h/d)	10.50	10.50	10.50	-	-
Dried Pomegranate peel	0.00	0.10	0.20	-	-
Total DMI/h/d	9.82	9.91	9.99	-	-
Feed conversion ratio (kg/kg)[1]	8.63	8.61	8.57	0.027	0.678
Economic efficiency					
Concentrate price (LE/kg)	12.00	12.00	12.00	-	-
Rice straw (LE/kg)	1.00	1.00	1.00	-	-
Parsley hay (LE/Kg)	3.00	3.00	3.00	-	-
Dried Pomegranate peel (LE/Kg)	4.00	4.00	4.00	-	-
TMR Price ((LE/kg)	7.57	7.54	7.50	-	-
Total Feed cost (LE/h/d)[2]	79.49	79.89	80.29	-	-
Feed cost (LE/1Kg gain)[3]	93.20	90.78	87.22	-	-
REE (%) / 1kg gain [4]	100%	97%	94%	-	-
Daily gain income (LE/h)[5]	119.40	123.20	128.87	-	-
Income (LE/h/d)[6]	39.92	43.32	48.59	-	-
REE (%) /h/d[7]	100%	109%	122%	-	-

DMI stands for dry matter intake, kg for kilogrammes, and d for day. Relative economic efficiency, or REE.1 The feed conversion ratio is calculated by dividing the amount of gain (kg) by the amount of DMI (kg). 2TMR price (LE/kg) = total feed cost (LE/h/d)* Intake of feed, as fed (kg/h/d). Cost of feed (LE/1Kg gain)3. Feed costs for a kilogramme of gain. 4REE(%) / 1kg gain: The cost of feed intake for each group's production of one kilogramme of gain per lamb in comparison to the cost *100 for the control group. The average daily gain multiplied by the market price of one kilogramme of life weight (140LE) is the daily gain income (LE/h). 6Income (LE/h/d): Total Feed Cost (LE/h/d) - Daily Gain Income (LE/h). Income (LE/h/d) in each group as a percentage of the control group *100 is 7REE (%) h/d.

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تأثير أضافـة قشور الرمان الي علائق العجول البلدي الهجين علي هضم العناصر الغذائيه ، معدل النمو، بعض معايير الدم، مضادات الأكسدة، والكفاءة الاقتصادية

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الملخص

أُجريت هذه الدراسة لدراسة تأثير إضافة قشر الرمان المجفف (DPP) على الأداء، وكمية المدخول، وهضم العناصر الغذائية، والقيمة الغذائية، ومعايير الدم، ومعامل التحويل الغذائي، والكفاءة الاقتصادية في تربية عجول بلدي هجينة. ثلاثين عجلا بمتوسط وزن حي (201.74 ± 4.05 كجم) في بداية التجربة، قُسِّمت عشوائيًا إلى ثلاث مجموعات (10 لكل مجموعة). تلقت الحيوانات حصصًا بمستويات مختلفة منDPP (0 و 100 و 200 جم / ساعة / يوم في G1 و G2 و G3 على التوالي). أظهرت النتائج أن قيم معاملات الهضم والقيمة الغذائية لم تتأثر بشكل كبير (P <0.05) باستثناء أن هضم CP كان أعلى بشكل كبير (P <0.05) في G2 مقارنة بـ G1 و G3. كانت معايير الدم للعجول التجريبية ضمن النطاقات الطبيعية لـ ALT و AST والكوليسترول والدهون الثلاثية واليوريا والكرياتينين والألبومين والبروتين الكلي دون أي اختلاف كبير (P> 0.05). بخلاف ذلك، زادت السعة المضادة للأكسدة الكلية (TAC) ومؤشر البلعمة وتحويل الخلايا الليمفاوية واختبار الجلوتاثيون بشكل كبير في G2 و G3 مقارنة بمجموعة التحكم (G1). وقد وجد تأثير إيجابي على الكفاءة الاقتصادية للتغذية إلى جانب تحسين معامل التحويل الغذائي وخفض تكلفة التغذية لزيادة وزن 1 كجم. ويمكن الاستنتاج أن إضافة 100 و200 جم من DPP / ساعة / يوم موصى بها وربما تكون استراتيجية جيدة لتحسين أداء المجترات والمناعة وحالة مضادات الأكسدة والربحية لمزارع الثروة الحيوانية.

الكلمات الدالة: هضم العناصر الغذائية، قشر الرمان، المناعة في المجترات، مضادات الأكسدة، الكفاءة الاقتصادية.