EFFECT OF SOME AROMATIC PLANTS BY PRODUCTS ON THE *IN VITRO* RUMEN FERMENTATION AND BUFFALO'S MILK PRODUCTION IN EARLY LACTATION

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SUMMARY

Evaluate impact of the marjoram and parsley by-products on rumen fermentation characteristics (in vitro) and the productive performance of early lactating buffaloes (in vivo) are the main objectives of this study. Two in vitro experiments were conducted to evaluate the effect of partial and full substitution of control ration's rice straw by marjoram and parsley by-products on rumen fermentation characteristics. In the in vivo study; fifteen lactating buffaloes after 2 weeks of calving were randomly assigned into three groups using complete random design. Buffaloes were fed dry matter according to 3% of their body weight for 60 days. The first animal's group was fed on the control ration (60% CFM and 40% rice straw). The second group was fed 60% CFM and 40% parsley by-products (CP100), while the third group was fed 60% CFM and 40% marjoram by-products (CM100). The results indicated that full replacement of rice straw by marjoram (CM100) and parsley (CP100) by-products led to 1) significant ($P < 0.05$) increased in vitro degradability of ration's DM, OM, NDF and ADF with improving all ruminal basic parameters (pH, NH3-N, TVFA, s, SCFA and total gas production. 2) significant ($P<0.05$) increased in ability of the lactating buffaloes for more digestion of diet's DM, OM, CP and NFE. The buffaloes fed (CP100) ration had higher ($P<0.05$) blood plasma protein, albumin and globulin with higher ($P<0.05$) milk, 4% fat corrected milk (FCM) and all milk component yields. It could be concluded that; parsley by-products significantly enhance buffalo's milk production with no harmful effects on their health and we recommend them as roughage sources, especially in the summer.

Keywords: *Aromatic plants by-products, marjoram, parsley, in vitro, buffaloes, milk yield and milk composition.*

INTRODUCTION

Aromatic plants gotten more interest by scientific researchers as well as industry men because of their strong antimicrobial and antioxidant properties and significant nutritional content of minerals, phenols and carotenoids (Ozcan *et al*., 2005; Suhaj, 2006 and Azzaz *et al*., 2016). Today the aromatic plants are cultivated in several areas of Egypt especially in villages of Fayoum and Beni Sueif provinces. The total cultivated area with medicinal and aromatic plants in Egypt reached 63347 feddans and produce around 100690 ton/year (Agricultural Economics**,** 2007).

Sweet marjoram (*Origanum majorana L*) and parsley (*Petroselinium crispum)* are widely used as a garnish and are used for different medicinal purposes in folklore medicine of Egypt. Sweet marjoram is aromatic herb grows to a height of 30 to 60 cm with large number of leafy stalks with small leaves and white or red small flowers. The most of marjoram essential oil is found in the leaves, whereas only traces are found in flowers and stalks (Potty and Krishna Kumar, 2001). On the other hand, parsley grows from one root and their heights about 60 to 100 cm, the leaves (main part) are tripinnate and possesses the essential oil (Farzaei *et al*., 2013). Both of these plants are harvested in early summer before flowering and the foliage is cut off about 6 cm above the ground and it will put out new shoots and yield another crop in autumn (Potty and Krishna Kumar, 2001).

For industrial purpose, the marjoram and parsley leaves are dried, carefully cleaned and stored. Stems or stalks (by-products) are separated from leaves by rubbing on hand sieves of 1 to 2 cm mesh. These by-products can serve as roughages for farm animal feeding, especially that prices of wheat and rice straws (main roughages used in animal feeding in summer) are continuously elevating. The attempts to use aromatic plants by-products as feed resources for calves, cows and sheep have been reported (Wojcik *et al*., 1984, Tiwari *et al*., 1996 and Djouvinov *et al*., 1997). In this concern, some of agricultural by-products have been fully screened for their uses in animal feeding such as wheat straw and rice straw. Whilst many more are yet to be evaluated before being used as animal feed, aromatic plants by-products are among of them. Therefore, this study was conducted to evaluate impact of the marjoram and parsley by-products on rumen fermentation characteristics (*in vitro*) and the productive performance of early lactating buffaloes (*in vivo*).

MATERIALS AND METHODS

The *in vitro* studies and the chemical analysis were carried out at the laboratories of Diary Department, National Research Center, Dokki, Giza, Egypt and Animal Production Department, Faculty of Agriculture, Ain Shams University, Egypt. The *in vivo* part of this work was carried out at the experimental station of Animal Production Department, Faculty of Agriculture, Fayoum University, Egypt.

***In vitro* studies:**

Two *in vitro* experiments were conducted for investigate the potential use of marjoram and parsley by-products as ruminant feed ingredient. In the first one, ruminal *"in vitro"* dry matter and organic matter digestion (IVDMD & IVOMD) for marjoram and parsley by-products as a replacement for rice straw of the control ration at different percentages, 25,50,75 and 100% have been determined. The control ration consisted of 60%concentrate feed mixture (52% yellow corn, 20% soybean cake, 10% wheat bran, 10% rice bran, 3.5% molasses, 3% limestone, 1% common salt and 0.5% minerals mixture) and 40% rice straw. The chemical composition of feed ingredients is shown in Table (1), while the chemical composition of the tested rations is shown in Table (2). For obtaining of the rumen microorganisms **(**inoculum), rumen fluid was collected from rumen of slaughtered rams fed berseem hay ration. The obtained liquor was squeezed through four layered cheesecloth into a warmed oxygen-free plastic jars and immediately transported to laboratory at 39° C. Approximately 400 mg of each tested ration (ground through a 2 mm screen) was accurately weighed separately into 125-ml bottles. Each ration was tested in 6 replicates accompanied by 6 blank bottles (no substrate). Each bottle was filled with 40 ml of mixture of 1:3 (v/v) rumen fluids: buffer solution as described by Tilley and Terry (1963)**.**

Table (1): Chemical composition of feed ingredients (on DM basis).

Item	DM	OM	CP	EE	CF	NDF	ADF	NFE	Ash
CFM	91.90	91.40	15.40	3.40	15.10	22.90	16.36	57.5	8.60
Rice straw	92.76	88.09	2.95	1.53	39.81	72.00	47.00	43.8	11.91
Parsley by-products	92.01	79.85	10.24	2.52	26.09	29.92	21.20	41.0	20.15
Majoram by-products	93.10	81.43	9.12	2.75	29.26	63.72	53.32	40.3	18.57

CFM: Concentrate feed mixture, DM: Dry matter, OM: Organic matter, CP: Crude protein, EE: Ether extract, NFE: Nitrogen free extract, NDF: Neutral detergent fiber, ADF: Acid detergent fiber and CF: Crude fiber
Concentrate feed mixture composed of 52% yellow corn, 20% soybean cake, 10% wheat bran, 10% rice bran, 3.5% molasses, 3% limestone, 1% common salt and 0.5% minerals mixture

In the second *in vitro* study; batch fermentation culture experiment was conducted according to El-Sherbiny *et al*. (2016) to evaluate the effect of full substitution of control ration's rice straw by marjoram and parsley by-products on rumen fermentation characteristics. Each treatment was tested in 3 replicates accompanied by 3 blank vessels (no substrate). The tested rations (400 mg) were added separately to the 125 ml incubation vessels. Each vessel was filled with 40 ml of mixture of 1:3 (v/v) rumen fluids**:** buffer solution. All vessels were sealed and incubated at 39° C for 24 h. After 24 h of incubation, all vessels were filtered in fiber filter bags 25 micron porosity (ANKOM- USA). The residues in the bags were dried at 70° C in oven for 48 h to analyses dry matter (DM), organic matter (OM), neutral detergent fiber (NDF) and acid detergent fiber (ADF) digestibility. The NDF and ADF were determined using the methods described by Van Soest *et al*., (1991). Rumen fluid pH was measured using (pH-meter). Overall volume of the produced gases was determined using Hohenheim Syringes (100 ml) as described by Navarro-Villa *et al*., (2011). Quantitative analysis of ammonia concentration was carried out by a modified Nessler's method as described by Szczechowiak *et al*. (2016). The total volatile fatty acids (VFA) were determined by steam distillation method as described by Warner (1964). The short chain fatty acids (SCFA) concentration was calculated according to equation of Makkar (2005) as the following equation:

$$\text{SCFA (mmol)} = 0.0222\ \text{Gas} - 0.00425$$

Where, Gas: is gas production at 24 hours incubation (ml/200 mg DM)

Table (2): Chemical composition and *in vitro* degradability of the tested rations (on DM basis).

Item	Control	CP25	CP50	CP75	CP100	CM25	CM50	CM75	CM100	SE±
DM	92.24	92.17	92.09	92.02	91.94	92.28	92.31	92.35	92.38	0.03
OM	90.08	89.25	88.43	87.60	86.78	89.41	88.74	88.08	87.41	0.21
CP	10.42	11.15	11.88	12.61	13.34	11.04	11.65	12.27	12.89	0.18
EE	2.65	2.75	2.85	2.95	3.05	2.77	2.90	3.02	3.14	0.03
CF	24.98	23.61	22.24	20.87	19.50	23.93	22.87	21.82	20.76	0.48
NFE	52.03	51.74	51.46	51.17	50.89	51.67	51.32	50.97	50.62	0.08
NDF	42.54	38.33	34.12	29.92	25.71	41.71	40.88	40.66	39.23	1.32
ADF	28.78	26.20	23.62	21.04	18.46	29.41	30.04	30.67	31.31	1.05
Ash	9.92	10.75	11.57	12.40	13.22	10.59	11.26	11.92	12.59	0.20
IVDMD%	39.17^{b}	41.57^{b}	42.41^{b}	47.69^{ab}	53.33^{a}	40.09^{b}	41.98^{b}	43.68^{b}	47.22^{ab}	1.29
IVOMD%	43.60^{b}	46.00^{b}	46.84^{b}	52.12^{ab}	57.76^{a}	44.52^{b}	46.41^{b}	48.11^{b}	55.18^{a}	1.30

Control: 60% CFM+40% Rice straw, CP25: 60% CFM+30% Rice straw+10% Parsley by-product, CP50:60% CFM+20% Rice straw+20% Parsley by-product, CP75:60% CFM+10% Rice straw+30% Parsley by-product, CP100:60% CFM+40% Parsley by-product, CM25: 60% CFM+30% Rice straw+10% Majoram by- product, CM50: 60% CFM+20% Rice straw+20% Majoram by- product, CM75: 60% CFM+10% Rice straw+30% Majoram by-product, CM100: 60% CFM+ 40% Majoram by- product, IVDMD%: in vitro dry matter degradability and IVOMD%: in vitro organic matter degradability.
a and b means at the same row with different superscript are significantly (P<0.05) different.
±SE: standard error

In vivo study:

Digestibility and lactation trails:

Fifteen lactating buffaloes (aged 4-6 years and weighting 550 kg on average), after 2 weeks of calving were randomly assigned into three groups, 5 animals each, using complete random design. The entire experimental period was 60 days**.** Buffaloes were fed dry matter according to 3% of their body weight. The first animal's group was fed on the control ration (that is consisted of 60% CFM and40% rice straw)**.** The second group was fed 60% CFM and 40% parsley by-products (CP100), while the third group was fed 60% CFM and 40% marjoram by-products (CM100). The rations were offered twice daily at 8.00 a.m. and 4:00 pm and the fresh water was available all the time for all experimental groups. The chemical composition of the tested rations is shown in Table (2).

During the final three days of each month of the experimental period (60 days), feces were collected from the rectum of each animal by hand at 12:00 p.m., dried at 60 °C for 48 h, and then ground for chemical analysis. Acid insoluble ash technique of Ferret *et al*, (1999) was used for determination of nutrient digestion coefficients**.** The nutrients digestibility coefficients were calculated according to the following formula:

Digestion co-efficient = $$100 - \left[100\ x\ \frac{\%\ indicator\ in\ feed}{\%\ indicator\ in\ feces}\ x\ \frac{\%\ nutrient\ in\ feces}{\%\ nutrient\ in\ feed} \right]$$

Feed and fecal analysis:

Chemical analysis of feed stuffs and feces samples were carried out to determine the percentage of dry matter (DM), crude protein (CP)**,** ether extract (EE), crude fiber (CF) and ash content using the methods of A.O.A.C. (1995). The nitrogen free extract (NFE) was calculated by difference [100- (CP+ EE+ CF+ ash)].

Sampling and analysis of blood plasma:

At the last day of each month of the experimental period, blood samples were collected in glass tubes containing EDTA as an anticoagulant agent from the jugular vein of each animal at 12:00 p.m. (4h after the distribution of morning feed) and then centrifuged at 4000 r.p.m. /20 min. to separate the plasma. The obtained plasma was stored at −18 °C till analysis. Plasma total protein and albumin were determined as described by Armstrong and Carr (1964) and Doumas *et al*. (1971), respectively. Then globulin and albumin/globulin ratio were calculated. Plasma creatinine concentration was determined according to method of Henary (1974), while cholesterol and triglycerides was determined according to method of Burtis *et al*. (2006).

Sampling and analysis of milk:

Milk samples were taken every 2 weeks throughout the experimental period. Buffaloes were milked by hand twice a day at 8:00 am and 7:00 pm. Milk samples were collected immediately from each animal after morning and evening milking and milk yield was recorded**.** Milk samples were analyzed for total solids, fat, total protein and lactose by Bentley[150]infrared milk analyzer (Bentley Instruments, Chaska, MN, USA) according to A.O.A.C. (1995) procedures. Solids-not-fat (SNF) was calculated. Fat corrected milk (4% fat) was calculated by using the following equation according to Gaines, (1928):

FCM = 0.4 M + 15 F, Where: FCM= fat-corrected milk, M= milk yield (g) and F= fat yield (g).

Statistical analysis:

Data obtained from this study were statistically analyzed by SPSS (2008) according to the following model:

$$Y_{ij} = \mu + T_i + e_{ij}.$$

Where Y_{ij} is the parameter under analysis of the ij *in vitro* bottle or buffalo, μ is the overall mean, T_i is the effect due to treatment on the parameter under analysis, eij is the experimental error for ij on the observation**.** Duncan's multiple range tests were used to test the significance among means (Duncan, 1955).

RESULTS AND DISCUSSION

In vitro studies:

Data of Table (2) showed gradual increase in the *in vitro* dry matter (IVDMD %) and organic matter (IVOMD %) degradability with increasing level of marjoram and parsley by-products inclusion in the rations. Increasing level of marjoram and parsley by-products inclusion up to 100% gave the highest ($P<0.05$) values of IVDMD % and IVOMD %. This may be due to increase in microbial colonization of feed particles due to higher CP and EE with lower CF, NDF and ADF contents of marjoram and parsley by-products than those of rice straw (Table, 1). The results of the *in vitro* batch culture match the data of the first *in vitro* trial (Table, 3). The full replacement of rice straw by marjoram (CM100) and parsley (CP100) by-products led to significant ($P < 0.05$) increase in degradability (%) of ration's DM, OM, NDF and ADF with improve all ruminal basic parameters (e.g. pH, NH_3-N,TVFA,SCFA and total gas production (Table, 3). It is worth to mention that, parsley by-products inclusion in the rations showed superiority over marjoram by-products for improving IVDMD % and IVOMD % (first *in vitro* trial) and all rumen characteristics (second *in vitro* trial). The lowest pH value was recorded by CP100 followed by CM100, while the highest pH value was recorded by the control ration. In contrast, ammonia-nitrogen (NH_3-N), total volatile fatty acids (TVFA), and short chain fatty acids (SCFA) concentrations and total gas production volume recorded the highest values by CP100 followed by CM100, while the lowest values were recorded by the control ration (Table 3). The pattern of pH, TVFA's and NH_3-N concentrations and volume of total gas production reflects the pattern of fermentation efficiency in the rumen. The superiority of parsley by-products over marjoram by-products and rice straw is reasonable due to its higher CP and EE with lower CF, NDF and ADF contents, which led to increase digestion and metabolism activity of the rumen microflora and enhance liberation of a large amount of fermentable carbohydrate and ammonia-nitrogen which in turn causes higher TVFA, SCFA and total gases production (Azzaz *et al*., 2016) On the other hand, the antioxidant and antimicrobial activities of parsley and marjoram by-products may provide a suitable environment for the growth of beneficial microflora in the rumen and let for more feed nutrients fermentation and subsequently more NH_3-N and TVFA's production (Azzaz *et al*., 2016).

Table (3): Effect of tested rations on *invitro* rumen characteristics.

Item	Control	CP100	CM100	SE±
Degradability %				
Dry matter	55.03^{c}	69.00^{a}	65.41^{b}	2.13
Organic matter	64.93^{c}	82.21^{a}	78.00^{b}	2.63
Neutral detergent fiber	43.59^{c}	61.61^{a}	54.57^{b}	2.64
Acid detergent fiber	26.30^{b}	52.56^{a}	33.77^{b}	4.14
Rumen basic parameters				
pH	6.64^{a}	6.57^{b}	6.60^{ab}	0.01
Ammonia-Nitrogen (µmol/L)	0.60^{c}	1.08^{a}	0.83^{b}	0.14
Total volatile fatty acids (mEq/dl)	6.90^{b}	8.00^{a}	7.77^{ab}	0.22
Short chain fatty acids (mEq/dl)	1.68^{c}	1.77^{a}	1.71^{b}	0.01
Total gas production (ml/24hr)	137.67^{c}	144.67^{a}	140.33^{b}	1.03

Control: 60% CFM+40% Rice straw, CP100:60% CFM+40% Parsley by-product and CM100: 60% CFM+ 40% Majoram by- product
a, b and c means at the same row with different superscript are significantly (P<0.05) different.
±SE: standard error

In vivo study:

Nutrients digestibility and nutritive value:

Data of Table (4) showed significant ($P<0.05$) higher of apparent digestibility of DM, OM, CP and NFE for buffaloes fed parsley and marjoram by-products containing ration (CP100 and CM100) compared with those fed the control ration, while EE and CF digestibility were not changed among all groups. The nutritive values of the experimental rations as total digestible nutrients (TDN) and digestible crude protein (DCP) are shown in Table (4). The buffaloes fed (CP100) showed the highest ($P<0.05$) TDN and DCP values, followed by buffaloes fed (CM100) then buffaloes fed the control ration, which recorded lowest values for TDN and DCP. These results are in line with those obtained by Wojcik *et al*., (1984), Allam *et al*., (1999) and Mohamed and Ibrahem (2003). The improvement in nutrients digestibility and nutritive values of rations contain aromatic plants by products (CP100 and CM100) may be due to increase digestion and metabolism activity of the rumen microflora as direct effect of effective substances (phenols and carotenoids) of marjoram and parsley by-products (Farzaei *et al*., 2013). Also, the strong antimicrobial and antioxidant properties of parsley and marjoram by-products may play an important role in growth inhibition of the ruminal methanogenic bacteria (archaea) and thereby increase digestion efficiency and decrease losses of ration energy for more milk production.

Table (4): Effect of tested rations on digestibility coefficients and nutritive values.

Item	Control	CP100	CM100	±SE
Apparent nutrients digestibility (%)				
Dry matter	60.89[b]	65.09[a]	63.64[a]	0.69
Organic matter	64.41[b]	68.02[a]	65.58[a]	0.66
Crude protein	57.61[c]	78.03[a]	68.39[b]	3.13
Ether extract	74.76	80.78	81.29	1.67
Crude fiber	59.28	61.76	59.68	0.78
Nitrogen free extract	71.16[b]	75.62[a]	74.65[a]	0.90
Nutritive value (%):				
TDN	62.31[b]	66.48[a]	64.74[ab]	0.78
DCP	6.00[c]	10.41[a]	8.81[b]	0.66

TDN: Total digestible nutrients, DCP: Digestible crude protein, Control: 60% CFM+40% Rice straw, CP100:60% CFM+40% Parsley by-product and CM100: 60% CFM+ 40% Majoram by- product
a, b and c means at the same row with different superscript are significantly ($P<0.05$) different.
±SE: standard error

Blood parameters:

The buffaloes fed (CP100) ration had higher ($P<0.05$) plasma protein, albumin and globulin values followed by those fed (CM100), while buffaloes fed control ration recorded the lowest plasma protein, albumin and globulin values (Table 5).This may be due to a higher crude protein (CP) content of parsley by-products (Table 1) beside higher crude protein (CP) digestibility by buffaloes fed (CP100) ration compared to other animal's groups (Table 4). In contrast, the buffaloes fed control ration had higher ($p<0.05$) plasma creatinine and cholesterol than those fed rations containing aromatic plants by products (CP100 and CM100). This reflects the positive effect of parsley and marjoram by-products on the metabolic process as well as animal's health. In addition, there were no significant differences between all animal's groups in plasma albumin / globulin ratio and triglycerides concentrations. It is worth mentioning that all measured blood plasma parameters among the experimental buffaloe's groups are within the normal physiological range for healthy animals.

Table (5): Effect of tested rations on blood parameters of lactating buffaloes.

Item	Control	CP100	CM100	±SE
Total protein (g/dl)	5.87[c]	6.81[a]	6.52[b]	0.14
Albumin (g/dl)	2.84[b]	3.34[a]	3.45[a]	0.12
Globulin (g/dl)	3.03[b]	3.47[a]	3.07[b]	0.10
A/G ratio	0.94	1.11	0.93	0.05
Cereatinine (mg/dl)	1.25[a]	1.02[b]	1.13[ab]	0.04
Cholesterol (mg/dl)	98.47[a]	95.71[b]	91.79[b]	1.07
Triglycerides (mg/dl)	49.25	50.84	50.88	0.24

A/G: Albumin/ Globulin ratio.
a, b and c means at the same row with different superscript are significantly ($P<0.05$) different.
±SE: standard error

Milk yield and composition:

Milk composition was not affected by inclusion of aromatic plants byproducts in buffaloe's rations, while milk and 4% fat corrected milk (FCM) and all milk component yields were higher ($p<0.05$) for buffaloes fed (CP100) ration than those fed the control and CM100 rations (Table 6). Inclusion of parsley by-products in lactating buffaloe's rations increased their milk production by 14.81 % and fat corrected milk production by 17.4%, while inclusion of marjoram by-products increased buffaloe's milk production by just 3.3% and fat corrected milk production by 3.2 % compared with the control. These findings are in agreement with the results obtained by El-Garhy (2012a, b). This response may be attributed to generation of more nutrients which become available as a result of improvements in feed digestibility

(Table 4). In addition, increase ruminally fermented DM and OM (Table 2, 3) may result in a numerical downward shift in the ratio of acetate to propionate, which may lead to increase delivery of glucogenic precursors to the mammary gland.

Table (6): Effect of tested rations on buffalo's milk yield and composition.

Item	Control	CP100	CM100	± SE
Milk yield				
Milk yield (Kg/d)	7.02[b]	8.06[a]	7.25[b]	0.09
4% FCM yield (Kg/d)	9.15[b]	10.74[a]	9.44[b]	0.15
Protein yield (g/d)	191.39[b]	225.23[a]	198.92[b]	4.88
Fat yield (g/d)	423.07[b]	501.23a	439.57[b]	8.32
Lactose yield (g/d)	381.59[b]	482.98[a]	435.06[ab]	13.48
Ash yield (g/d)	49.01[b]	55.65[a]	51.16[ab]	1.05
Total solids yield (g/d)	1043.57[b]	1245.7[a]	1095.75[b]	20.35
Solids not fat yield (g/d)	620.51[b]	744.47[a]	662.8[b]	14.68
Milk composition %				
Total protein	2.71	2.79	2.74	0.05
Fat	6.03	6.21	6.06	0.07
Lactose	5.48	6.03	6.00	0.17
Ash	0.70	0.69	0.71	0.01
Total solids	14.89	15.49	15.11	0.20
Solids not fat	8.86	9.28	9.13	0.16

a and b means at the same row with different superscript are significantly ($P<0.05$) different.
±SE: standard error.

CONCLUSION

It can be concluded that inclusion of parsley and marjoram by-products up to 40% in lactating buffaloes rations positively affect rumen fermentation characteristics (*in vitro*) and improve nutrient digestibility (*in vivo*). Parsley by-products significantly enhance buffalo's milk production and it is recommend as roughage source especially in the summer.

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تأثير مخلفات بعض النباتات العطرية على تخمرات الكرش معمليا وعلى انتاج اللبن من الجاموس الحلاب فى مرحلة الحليب المبكر

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اهم اهداف هذه الدراسة هو تقييم اثر مخلفات البقدونس والبردقوش على تخمرات الكرش معمليا وعلى الاداء الانتاجى للجاموس الحلاب فى مرحلة الحليب المبكر مزرعيا. اجريت تجربتين معمليتين لتقييم اثر الاحلال الجزئى والكلى لقش الارز فى العليقة المقارنة بكل من مخلفات البقدونس والبردقوش على قياسات الكرش. فى التجربة المزرعية تم تقسيم عدد 15 جاموسة حلابة بعد الولادة باسبوعين عشوائيا على 3 مجموعات باستخدام نظام تصميم التجارب تام العشوائية. تم تغذية الحيوانات تبعا ل3% مادة جافة من الوزن الحى لمدة 60 يوم. مجموعة الحيوانات الاولى تم تغذيتها على العليقة المقارنة (60% خليط علف مركز+ 40% قش الارز) وتغذت مجموعة الحيوانات الثانية على (60% خليط علف مركز+ 40% مخلفات بقدونس) بينما تغذت المجموعة الثالثة على (60% خليط علف مركز+ 40% مخلفات بردقوش). أظهرت النتائج أن:الاستبدال الكلى لقش الارز فى العليقة المقارنة بمخلفات البقدونس والبردقوش عمل على 1) زيادة معنوية فى هضم المادة الجافة والعضوية وشقوق الالياف مع تحسين كافة قياسات الكرش كاالاس الهيدروجينى وتركيزات كل من الاحماض الدهنية الطيارة الكلية وقصيرة السلسلة والامونيا وانتاج الغاز الكلى معمليا. 2) زيادة معنوية فى معاملات هضم كل من المادة الجافة , المادة العضوية , البروتين الخام والمستخلص الخالى من النيتروجين بواسطة الجاموس الحلاب مزرعيا. الجاموس المعذى على مخلفات البقدونس اعطى اعلى قيم معنوية لتركيزات البروتين , الالبيومين والجلوبيولين فى بلازما الدم بجانب اعطائه اعلى انتاج معنوى للبن الحقيقى واللبن معدل نسبة الدهن ل4% وكذلك محصول كل مكونات اللبن. و الخلاصة: ان استخدام مخلفات البقدونس فى تغذية الجاموس الحلاب فى مرحلة الحليب المبكر حسن من انتاج اللبن معنويا دون اى أثار سلبية على صحة الحيوانات ونوصى باستخدامه كمصدر علف خشن خاصة فى الصيف.