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# EFFECT OF NATURAL PLANT SUPPLEMENTS TO DIET OF LOCAL GOATS ON THEIR GROWTH PERFORMANCE.

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## ABSTRACT

Sixteen of baladi male goats aged 6 months old with an average weight 20.2 Kg were divided into four groups (each of four animals) to study the growth promoting effect of onion and garlic. The groups were subjected at random to feed on four formulated rations mixtures. The first group (control) was fed on concentrate feed mixture CFM without supplements, while animals in second, third and fourth groups were fed on CFM+ 2000 g of fresh onion, CFM + 600g of remainder fresh garlic and CFM + 1000g of remainder fresh onion + 300g of remainder fresh garlic group, respectively, as supplements. Animals in all groups were fed on concentrate feed mixtures (CFM) *ad lib*. The diets were given for a fattening period which lasted for 112 days.

Four digestibility and nitrogen balance trials were conducted at the end of the feeding experiment. The main results showed that feed supplements significantly ($P \leq 0.05$) improved, the digestion coefficients of OM, CF,EE and NFE , than those of the control ration. All feed supplements improved average daily gain and feed conversion (Kg DM/Kg gain) by about 10.5, 15.8 and 13.1% and 10.7, 13.9 and 16.0% for rations II, III and IV, respectively, than those of control ration. However, such differences did not achieve significancy among groups.

Rumen fluid parameters (pH-ammonia-N and total volatile fatty acids), for rations containing different supplements were not significant changed before feeding than those for control group. However, supplementation were significantly ($P \leq 0.05$) increased ammonia –N and total volatile fatty acids 3 hrs. post feeding than control group. Blood plasma of animal feed rations supplemented with either onion or garlic were significantly ($P \leq 0.05$) lower in cholesterol and triglyceride than that of the control group. However, feeding supplements had no significant effect on plasma total protein, albumin, globulin, urea and creatinine.

Microbial count of rumen fluid from animal feed rations with onion or garlic supplements showed that bacteria, cellulose digesters, starch digester, proteolytic bacteria, lipolitic bacteria, methanogenic, lactobacilli, streptococci, actinomyceter and protozoa count were improved with experimental supplements than those with control ration. While fungi count was decreased ($P \leq 0.05$) with feed supplements than control ration. The economical efficiency of rations supplemented with onion and or garlic were remarkable and the feeding cost was decreased as kg DM/kg gain by 15.7, 15.8 and 19.1% in comparison with control ration.

It could be concluded that remainder onion and or garlic are advisable to be added in fresh form to rations of growing goat diets to improve their growth performance and to decrease the feeding cost in practical feeding applications.

**Keywords:** baladi goats , onion, garlic, growth, rumen parameter, blood parameter, microbial count.

## INTRODUCTION

There is a need trend to use some growth promoters and feed ingredients derived from plant origin to avoid the detrimental effects of the chemical growth promoters.

Onion has valuable nutrients such as vitamins, minerals and essential amino acids and fatty acids (Flores, 1951; Katayama *et al*., 1956 and Hariedy , 1977). Garlic also has antibacterial , antifungal , antitoxic and antiparasitic properties (Youssef and Hammad, 1994; Hammad and Youssef, 1994 and Mohawed *et al.*, 1996).

On the other hand, feedstuffs including corn, cotton seed, soybean and wheat bran has been found as natural contaminated with mycotoxins, (Borker *et al*., 1966). So contamination of feedstuffs with aflatoxins is considered dangerous to milk consumers, because aflatoxin is readily transmitted to milk of dairy cattle fed contaminated meal. It is apparent from the facts presented previously that there has been a need on objective and definitive investigation of the food for human consumption (Mohawed *et al*., 1996) also found that there was a significant decrease in the count of A. flavus. This effect was completely alleviated at the higher concentrations of garlic juice. Moreover, garlic has valuable nutrients such as vitamins, minerals, essential amino and fatty acids (Flores, 1951 and Hariedy, 1977).

Few workers has studied the growth promoting effect of onion and garlic on different species of farm animals, however, little information are available on their effect as non-conventional supplements for growing local goats. Therefore, this study was conducted to investigate the nutritional response of growing local goats to fresh onion and garlic as dietary supplements.

## MATERIAL AND METHODS

The present study was carried out in the newly reclaimed area of West Nubaria Proviens (Abd El-Menaam Riad Village), and Animal and Poultry Nutrition and Production Department. National Research Center, Dokki, Cairo. In a feeding trial lasted 16 weeks, 16 of Baladi male goats aged 6 months old weighed in average 20.2 Kg were housed in four semi opened pens. Experimental animals were randomly divided into four similar groups, each to feed on one of the four experimental rations. Before the start of the experiment animals were adapted for a period of three successive weeks on experimental supplements where remainder onion and remainder garlic were offered with concentrate *ad-lib* to evaluate the maximum voluntary intake of fresh onion, garlic and onion + garlic on fresh basis .

From the result of the adaptation period, experimental supplements were adjusted according to the

maximum intake for each group (4 animals/group). The following four feeding treatments were:
I – Complete feed mixture *ad-lib* group.
II -Complete feed mixture *ad-lib* + 2000 g of chopped remainder fresh onion as a supplement group.
III-Complete feed mixture *ad-lib* + 600g of chopped remainder fresh garlic as a supplement group.
IV-Complete feed mixture *ad-lib* + 1000g of chopped remainder fresh onion + 300g of chopped remainder fresh garlic as a supplement group.

The chemical composition of feed ingredients and experimental rations are shown in Table 1. Concentrate feed mixture was daily offered *ad. libitum*. Feeds were offered twice daily in two equal portions at 8.00 a.m. and 2.00 pm. Feed residues were daily collected, and weekly weighed. The development of body weight was recorded fortnightly to adjust the daily amount of feed. Clean drinking water were freely available at all times. Four digestibility and nitrogen balance trials were conducted at the end of the feeding experiment where the first ten days were for adaptation with the metabolic crates and the following five days for feaces and urine collection. Three animals for each treatment (the same animals of the digestibility trial) were further used to obtain rumen fluid samples before and after 3 hr post feeding using a rubber stomach tube. Collected rumen fluid was strained through four layers of cheese cloth where rumen liquor pH was immediately determined using EIL digital combination electrode pH meter. The concentration of ammonia–N in the rumen fluid was determined according to Conway (1962) method. Ruminal total volatile fatty acids VFA's concentration were determined by steam distillation as described by Warner (1964). the rest of rumen sample's were kept frozen under-4C° till further microbiological studies .

The microbial content of the rumen liquer was estimated as described by Bryant and Robisons (1961) for total viable counts, Hungate (1957) for celluloytic bacteria Smith *et al*., (1952) for proteolytic bacteria, Hobson and Mann (1961) for lipolytic bacteria, Smith and Hungate (1958) for methanogenic bacteria, Kurihara *et al*., (1976) for starch digesters , Martin (1950) for actinomycetes, De-Man and Sharpe (1960) for lactobacilli, Medrek and Barnes (1962) for streptococci , Allen (1959) for fungi counts and malt extract agar was used for yeast counts Wistreich and Lechman (1984) for protozoa counts. Technique of colony forming unit (CFU) was adopted. Incubation took place at 30 ºC for 2-7 days. The same animals of digestibility trial were used to obtain blood samples (20 ml/animal ) before feeding at the end of feeding trial.

Blood samples were collected to estimate blood constituents. Serum was separated by centrifugation and frozen at-20ºC until analysis. Total protein, urea, creatinine, albumin, globulin, cholesterol and triglyceride were calorimetrically determined using commercial Kits, following the same steps as described by manufactures.

Feedstuffs and faecal sample were analyzed for moisture , ash, CP, CF and EE and nitrogen in urine according to the A.O.A.C. (1984) and NFE was calculated by difference. The economic efficiency of the experimental treatment had been calculated according to the currants prices in the local market. Statistical analysis were carried out using (SAS 1990).Statistical program for PC. Significant means were separated using Duncan's Multiple Range test (Duncan 1955).

**Table 1: Chemical composition of feed ingredients of experimental rations.**

| Items | Total Moist | DM | Chemical composition (% DM basis) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | OM | CP | CF | EE | NFE | Ash |
| Ingredients | | | | | | | | |
| Complete feed mixture (CFM)* | 9.51 | 90.49 | 90.08 | 16.26 | 13.20 | 2.50 | 58.12 | 9.92 |
| Onion | 86.86 | 95.26 | 95.19 | 14.18 | 5.57 | 4.52 | 70.92 | 4.81 |
| Garlic | 56.55 | 94.67 | 96.48 | 10.42 | 10.36 | 2.92 | 72.75 | 3.52 |
| Experimental rations: | | | | | | | | |
| I | - | 90.49 | 90.08 | 16.26 | 13.20 | 2.50 | 58.12 | 9.92 |
| II | - | 66.80 | 90.39 | 16.13 | 12.72 | 2.62 | 58.92 | 9.61 |
| III | - | 82.42 | 90.65 | 16.72 | 12.94 | 2.54 | 59.45 | 9.35 |
| IV | - | 68.89 | 90.59 | 15.89 | 12.71 | 2.61 | 59.38 | 9.41 |

*** CFM : Containing : 20% soya-bean meal, 20% wheat bran , 37% yellow corn, 20% shredded berseem straw, 1.7% lime stone, 0.30% primex** + vit, 1% sodium chloride.**
****Premix + vit. : each 3Kg/ ton of feed mixture containing 12500000 vit A, 2500000 vit $D_3$, vit E, 10000 mg, manganese 80000 mg, Zinc 60000 mg, Iron 50000 mg, copper 20000 mg, Iodine 5000 mg, Selenium 250 mg, cobalt 1000 mg. Carrier substance of calcium carbonate to completed till 3 Kg.**

## RESULTS AND DISCUSSION

Results concerning intake, nutrients digestibility, nutritive value and nitrogen balance of the different experimental rations as affected by onion or garlic and onion + garlic supplementation are presented in Table 2.

The results clearly showed that onion supplementation did not affect the dry matter intake of concentrate mixture. Augner *et al*. (1998) found that on the first day lambs offered onion flavored wheat ate significantly less than those given unadulterated wheat; however, no significant difference in intake was observed on the second and subsequent days. While Florek *et al* (1992) found that lamb exposed to onion ate more ($P \leq 0.05$ )onion-flavoured feed at higher concentrations, than lambs exposed to garlic . Similar results were obtained in the present study, since both garlic and garlic + onion supplementation decreased the dry matter intake of concentrate mixture by about 23.6 and 22.6% for garlic and onion + garlic supplementation, respectively compared with the control ration.

Similar results were reported by Rodriguez *et al*. (2000) they reported lower DM intake associated with good nutrients digestion due to the increase of rumination time. On the contrary, Allam *et al*. (1999) found that inclusion of garlic to the ration noticeably increased feed intake by 9.21% over that of the control ration. They attributed their results to effective groups in garlic supplements that might affect the hypothalamus gland to stimulate hungriness center in the brain to increase the desire for eating. Moreover, Dewit *et al*. (1979) mentioned that garlic acts as gastric stimulator which might be the cause of increasing the DM intake.

**Table 2: Feed intake, nutrients digestibility, nutritive value and nitrogen balance of the experimental rations.**

| **Items** | **Experimental rations** | | | | SE |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| **No of animals** | 3 | 3 | 3 | 3 | |
| **Mean body wt. Kg** | 30.7 | 31.7 | 31 | 30.3 | |
| **Mean daily intake (DM basis),g/d** | | | | | |
| CFM | 858.7 | 874.70 | 658.16 | 664.19 | |
| Add onion | - | 65.70 | - | 32.85 | |
| Add garlic | - | - | 65.17 | 32.58 | |
| Total | 858.7 | 940.40 | 723.33 | 729.62 | |
| DMI of body Wt.,% | 2.8 | 2.9 | 2.3 | 2.4 | |
| **Nutrient digestion coefficient** | | | | | |
| DM | 61.75 | 65.12 | 67.72 | 64.58 | $3.01^{NS}$ |
| OM | $65.41^{b}$ | $69.70^{a}$ | $71.67^{a}$ | $69.13^{b}$ | 1.89* |
| CP | $63.56^{b}$ | $60.76^{b}$ | $69.20^{a}$ | $60.49^{b}$ | 2.16* |
| CF | $40.06^{b}$ | $50.87^{a}$ | $50.81^{a}$ | $43.89^{b}$ | 3.01* |
| EE | $71.69^{c}$ | $78.09^{a}$ | $72.45^{bc}$ | $76.28^{ab}$ | 2.20* |
| NFE | $71.42^{b}$ | $75.85^{a}$ | $76.93^{a}$ | $75.41^{a}$ | 1.90* |
| **Dietary N utilization, g/h/d** | | | | | |
| N intake (NI) | $22.33^{ab}$ | $24.05^{a}$ | $18.20^{b}$ | $18.57^{b}$ | 2.54* |
| Faecal N | $8.17^{ab}$ | $9.39^{a}$ | $5.59^{c}$ | $7.25^{bc}$ | 0.97* |
| Urinary N | $11.98^{a}$ | $11.58^{a}$ | $9.49^{ab}$ | $8.20^{b}$ | 1.68* |
| N. balance (NB) | 2.18 | 3.07 | 3.11 | 3.11 | $0.53^{NS}$ |
| NB of NI% | $9.76^{c}$ | $10.76^{ab}$ | $17.09^{a}$ | $16.75^{a}$ | 2.78* |
| **Nutritive value (on DM basis)%** | | | | | |
| TDN | $61.15^{b}$ | $65.55^{a}$ | $67.25^{a}$ | $67.11^{a}$ | 1.76* |
| DCP | $10.33^{ab}$ | $9.79^{b}$ | $10.88^{a}$ | $9.66^{b}$ | 0.37* |
| E/P ratio | $5.91^{c}$ | $6.35^{ab}$ | $6.11b^{c}$ | $6.73^{a}$ | 0.22* |

**NS= non-significant difference** *** significant difference at ($P \leq 0.05$)**

**a,b,c Means with different superscripts are different at ($P \leq 0.05$).**

Results concerning nutrients digestibility and nutritive value of the different experimental rations, pointed out that onion , garlic and onion + garlic supplementations significantly ($P < 0.05$) improved almost all nutrients digestibility and the nutritive values of ration in terms of TDN.

Data of digestibility showed that feed supplements significantly ($P \leq 0.05$) improved the digestion coefficients of OM, CF, EE and NFE than those of control ration. The improvement of DM digestibilities of supplemented ration relative to the control one were ranging 4.5% to 9.7%, however, such increases did not attain significancy.

Experimental feed supplements significantly ($P < 0.05$) improved the nutritive value as TDN percentage than that of the control ration. The improvement was 7.2, 9.9 and 6.5% for rations II, III and IV, respectively, than control. These results are in agreement with those obtained by Allam *et al*. (1999) who studied the effect of garlic, supplementation in rations of Zaraibi goats which resulted in an improvement ($P \leq 0.05$) of digestibility coefficients of DM, OM, CP and nutritive values as TDN, SE and DCP compared with control ration, similar results were reported by Rodriguez *et al*. (2000) on deer and goats.

The result obtained for nitrogen balance indicated that goats given garlic and onion + garlic supplementation remarkably decreased urinary nitrogen loss. The higher retained nitrogen by feeding onion , garlic and onion + garlic supplementation were 40.8% , 42.7% and 42.6% respectively, in relative to control ration. Nitrogen utilization (N-balance/N - intake x 100) was significantly higher ($P < 0.05$) for II, III and IV

respectively, than control ration. These results are in agreement with Rodriguez *et al*. (2000) who found that garlic supplementation is improving the rumination time which might be the reason of improving the utilization of dietary nitrogen by rumen microbes.

Growth rates were comparable between animal groups ranging from 79.2 to 91.7 g/d (Table 3), the results clearly showed that all feed supplements improved average daily gain and feed conversion (Kg DM/Kg gain) by about 10.5, 15.8 and 13.1% and 10.7 , 13.9 and 16.0% for rations II, III and IV respectively, than control ration. However, such differences did not achieve significancy because of the high individuality of local goats. Similar results were observed by Dell *et al*. (1992) found that supplementing a probiotic containing garlic extract significantly improved the daily gain for treated veal calves. While El-Feel *et al*. (1999) showed that with Friesian and Buffalo calves receiving virginamycin or onion wastes both species gained more weight than with unsupplemented ration. In case of Friesian calves, the average daily gain (Kg/d) was 0.720 and 0.590 Kg/day being higher (<P< 0.01)for calves fed on supplemented rations with onion and virginamycin, respectively in comparison with control group (0.542 Kg/day). Similar results were obtained with Buffalo calves, the average daily gain (Kg/day) was higher (P <0.05) for calves received onion and virginamecin (0.503 and 0.673 Kg/day) compared with the control group (0.405 Kg/day). The higher growth rates for both species were associated with more efficient feed conversions.

These results are in agreement with the previous reports of Koremura *et al*. (1984); El-Nawawi (1991) and Osman *et al*. (1997) that onion has valuable nutrients such as vitamins; minerals and essential amino acids and fatty acids, therefore, it can stimulate growth rate .Also Corah *et al*. (1994). concluded that feedstuff such as carrots or cull onion fed at 10% of DMI may be used as an alternative feed source for finishing lambs, but detrimental effect on overall palatability of the product could result from feeding excess onion.

The characterization of rumen fluid parameters in terms of pH, total volatile fatty acids (VFA's, meq/dl) and Ammonia –nitrogen concentration ($NH_3$-N mg/dl) of goats are presented in Table 4.

**Table 3: Growth performance of goats fed the experimental rations.**

| Item | Experimental rations | | | | SE |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| NO of goats | 4 | 4 | 4 | 4 | |
| Initial wt,(kg) | 20.250 | 20.750 | 20.0 | 19.870 | 5.24$^{NS}$ |
| Final wt, (kg) | 29.750 | 31.250 | 31.00 | 30.625 | 4.793$^{NS}$ |
| Total gain (kg) | 9.5 | 10.5 | 11.0 | 10.755 | - |
| Av. Daily gain (g) | 79.2 | 87.5 | 91.7 | 89.6 | 10.967$^{NS}$ |
| DMI of body wt, % | 3.24 | 3.0 | 3.16 | 3.06 | |
| **Feed intake /head/day** | | | | | |
| DMI, g/d | 810 | 802 | 807 | 772 | - |
| TDN. g/d | 495 | 525.0 | 542.7 | 502.6 | - |
| DCP g/d | 83.6 | 78.4 | 87.80 | 74.57 | - |
| DE, Mcal 4.009 | 2178 | 2310 | 2388 | 2211 | - |
| ME, Mcal 0.82 | 1787 | 1894 | 1958 | 1813 | - |
| **Feed conversion** | | | | | |
| DM/gain, Kg/kg | 10.38 | 9.26 | 8.93 | 8.71 | 1.247$^{NS}$ |
| TDN./gain Kg/kg | 6.35 | 6.07 | 6.00 | 5.67 | 0.8057$^{NS}$ |
| DCP/gain g/g | 1.06$^{a}$ | 0.90$^{ab}$ | 0.96$^{ab}$ | 0.83$^{b}$ | 1.1280* |

**NS = not significant** *** significant at (P <0.05)**

**a,b means with different superscripts are different at (P < 0.05).**

It could be noticed that pH value for all experimental rations decreased after 3 hrs of feeding . The pH values were 7.1, 6.81, 6.84 and 6.95 before feeding and 6.88, 6.66 6.70 and 6.73 after 3 hrs of feeding for ration I,II, III and IV respectively. The pH values obtained at all times were within the range between 6-7 given by Mertens (1977) and Rokha (1988), who received from several reports that the normal value of ruminal pH ranged between 4.96 and 7.92.

**Table 4: Effect of experimental rations on some rumen liquor parameter of goats.**

| Item | Experimental rations | | | | SE |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| **Before feeding** | | | | | |
| PH | 7.10 | 6.81 | 6.84 | 6.95 | 0.165$^{NS}$ |
| Ammonia-nitrogen mg/dl | 11 | 13 | 14 | 12 | 3.501$^{NS}$ |
| Total volatile fatty acid m. eq./dl | 10 | 12 | 13 | 11 | 3.391$^{NS}$ |
| **After feeding** | | | | | |
| PH | 6.88$^{a}$ | 6.66$^{b}$ | 6.70$^{ab}$ | 6.73$^{ab}$ | 0.107* |
| Ammonia-nitrogen mg/dl | 23$^{b}$ | 30.0$^{a}$ | 32$^{a}$ | 31$^{a}$ | 1.449* |
| Total volatile fatty acid m. eq./dl | 15$^{b}$ | 20$^{ab}$ | 23$^{a}$ | 19$^{ab}$ | 2.883* |

**NS= non significant** ***= significant at (P ≤ 0.05)**

**a,b Means with different superscripts are different at (P < 0.05).**

Moreover, Koufmann (1972) stated that there is a regulation mechanism in the rumen that adjusted indirectly, the pH towards maintaining a medium or normal concentrations. Similar results were obtained by El-Feel *et al*. (1999) who found in Friesian and Buffalo calves receiving feed supplements as virginamycin and onion wastes, ruminal pH values in Friesian calves were not significantly changed at 0 and 3-hrs post feeding for virginamycin or onion wastes supplements than that control group. However, in the contrary ruminal pH values in Buffalo calves were significantly higher before feeding than control , while the difference than control was depleted to insignificant values after 3 hrs after feeding.

Similar results were obtained by Allam *et al*. (1999) who found that pH value for garlic supplemented rations were not significant at 0, 2, 4 and 6 hrs post feeding than control group with goats. The pH values in all of their rations were decreased gradually till 3-hrs post feeding. These results are in agreement with Khalifa (1972); Komaki *et al*. (1974) and Abdel-Aziz(1985) who found that rumen pH value in goats reached its minimum value at 3-4 hrs post feeding.

Ammonia-N concentrations for experimental groups were 11, 13,14 and 12 mg/dl rumen liquor (Table 4) before feeding with no significant difference between onion or garlic supplements on the rumen fluid while values of 23, 30, 32 and 31 mg/dl rumen liquor were recorded after 3-hrs of feeding for I, II , III and IV rations, respectively with a significant effect of supplementations than control rations. It should be noticed that ammonia–N concentrations were increased at 3-hrs post feeding. Higher concentration of ammonia-N determined at 3 hrs post feeding might be due to the effect of fermentation process on degradation of crude protein to ammonia-N after feeding.

These results are in agreement with those reported by Mohamed, (1998) and Mousa *et al*. (1998). They reported that ammonia-N concentration in the rumen liquid was at minimum level before feeding and increased to a maximum level at 3 hrs post feeding than the level of $NH_3$-N was decreased after 6 hrs of feeding. Similar results were obtained by El-Feel *et al*. (1999) on Buffalo and Friesian calves receiving virginamycin or onion wastes supplements that, ruminal ammonia-N (mg/100 ml) resulted in a nonsignificant effect before feeding than control, while a significant increase for $NH_3$-N than control was detected after 3 hrs post feeding. Similarly, Allam *et al*. (1999) found that $NH_3$-N value for garlic supplemented rations had no significant effect at 0,2,4 and 6 hrs post feeding compared with control groups of goats.

Total VFA's concentration determined at 0 and 3 hrs post feeding are shown in Table (4). There was no significant effect of experimental supplements on the rumen fluid VFA's before feeding. In contrast , at 3-hrs post feeding there was a significant effect when goats were fed on onion, garlic and onion + garlic supplementation in comparison with the control rations. El-Feel *et al*. (1999) found that Buffalo or Friesian calves received feed supplements as virginamycin or onion wastes resulted in a non-significant effect on VFA's concentration either before or after 3-hrs of feeding. Allam *et al*. (1999) on goats found that VFA's values with garlic supplemented ration were significantly higher at 6 hrs post feeding than control group. Fredrikson *et al*. (1995) found that the effects of onion on volatile fatty acid concentration and rumen pH were minimal and rumen ammonia nitrogen concentration was greater in wethers.

Average values of plasma constituents in goats as affected by onion garlic and onion + garlic supplementation vs. control animals are illustrated in Table (5). Results showed that feeding such supplements had no significant effect on total protein, albumin, globulin, urea and creatinine. On the other hand, all feed supplements showed significant decrease of cholesterol and triglyceride than the control ration. These results are in agreement with El-Feel *et al*. (1999), who found that onion wastes significantly ($P < 0.05$) decreased the level of plasma cholesterol in Buffalo calves in comparison with control calves. These results agreed with those obtained by Bordia *et al*. (1975). Sharma *et al*. (1975), Jain (1976); Abdo *et al*. (1983); El-Nahla (1983) and El-Nawawi (1991) who reported that onion and its oil reduced serum and plasma cholesterol levels in rabbits and broilers. Horton *et al*. (1991) found that the supplementation of garlic in rations of sheep and pigs had a depressive effect on blood serum lipids. Similar conclusion was reached by Kaul and Prasad (1990) who reported that the serum concentrations of lipids and cholesterol were lower in goat kids given garlic oil (0.625 mg/h/d).

**Table 5: Effect of treatments on some plasma constituents of goats:**

| Item | Experimental rations | | | | SE |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| Total protein (g/dL) | 6.8 | 7.3 | 7.1 | 6.9 | $0.49^{NS}$ |
| Albumin, g% | 3.4 | 3.6 | 3.5 | 3.4 | $0.23^{NS}$ |
| Globulin, g% | 3.4 | 3.7 | 3.6 | 3.5 | $0.28^{NS}$ |
| Urea mg% | 22.66 | 27.3 | 26.3 | 25.6 | $3.09^{NS}$ |
| Creatinine, (mg%) | 1.30 | 1.26 | 1.40 | 1.26 | $1.26^{NS}$ |
| Cholesterol (mg%) | $75.83^{a}$ | $62.0^{b}$ | $65.0^{b}$ | $59.3^{b}$ | 3.81* |
| Triglyceride (mg%) | $84.6^{a}$ | $62.4^{b}$ | $67.0^{b}$ | $57.6^{b}$ | 3.81* |

**NS= non significant** *** =P ≤ 0.05.**

**a,b, Means within the same raw having different superscripts are different significantly.**

Data in Table (6) showed that all feed supplements increased the total count of bacteria as compared with those for control ration. The number of total count of bacteria and cellulolytic bacteria was increased when

the diet was supplemented with such supplements.

These results were reflected on increasing dry matter , crude fiber, and nitrogen free extract digestibility in the present study. These results are in agreement with Mukhopadhyay and Kurap (1995) who found that rumen bacteria were more efficient in the DM digestibility, bacteria were comparatively more active in degrading NDF component of cell-wall . They also found that rumen bacteria are most active in the degradation of NDF, ADFand at the same time fungi and protozoa also play a significant role.

**Table 6: Effect of feeding experimental rations by goats on total and specific microbial groups counts ( x $10^6$ CFU $ml^{-1}$ fluid) in the rumen liquor**

| Items | experimental rations | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| **Post 3 hrs feeding** | | | | |
| Total count of bacteria | 37.3 | 59.3 | 63.1 | 68.2 |
| Cellulose digesters | 18.3 | 30.8 | 36.7 | 25.7 |
| Starch digesters | 2.4 | 6.0 | 6.7 | 5.1 |
| Proteolytic bacteria | 8.2 | 13.0 | 15.5 | 12.0 |
| Lipolitic bacteria | 11.6 | 19.5 | 19.0 | 19.4 |
| Methanogenic bacteria | 4.3 | 5.9 | 6.2 | 6.7 |
| Lactobacilli | 6.4 | 11.9 | 12.1 | 13.3 |
| Streptococci | 3.5 | 7.2 | 6.0 | 8.1 |
| Actinomyceter | 0.9 | 2.0 | 2.4 | 2.5 |
| Fungi | 1.2 | 0.20 | 0.10 | 0.22 |
| Protozoa | 0.09 | 0.34 | 0.32 | 0.38 |

**Each value is an average of 3 observations.**

Windham and Akin (1984) observed similar results that rumen bacteria was active in degrading of NDF of concentrate mixture. There was a decline in the digestibility of NDF with defounation. This might that the increase of bacterial biomass had not been compensated for the loss of protozoal mass in the In-vitro digestion (Lindsay and Hogan 1978).

The highest microbial count was for cellulose and starch digesters was reflected on increasing crude fiber and nitrogen free extract digestibility in the present study. The highest microbial count was for proteolytic, lipolitic, methanogenic, lactobacilli, streptococci and actinomycets when the diets was supplemented with feed supplements than that of control rations.Mukhopadhyay and Kurap, (1995) also found that the role-played by composite rumen microbial inoculum bacteria, protozoa and a fungi using concentrate mixture as substrates the efficiency of various microbial groups in the digestibility of DM was in the order of composite rumen inoculum > fungi> defounation > rumen bacteria. Also, Akin and Rigsby (1979) reported that fungi in the absence of bacteria are potentially able to degrade quantitatively as much of DM as the whole rumen population.

MuKhopadhyay and Kurap (1995) found that there is a substrate specificity for different rumen microbes for the digestion of DM, NDF and ADF of feedstuffs. Rumen bacteria are most active in the degradation of NDF and ADF and at the same time rumen fungi and protozoa also play a significant role. Youssef and Hammad (1994) concluded that garlic oil was more active against the tested bacteria compared with cumin oil. Also, B. cereus was the most sensitive one followed by staph. aureus, while *E.coli* and ps. aeruginosa were resistant to both oil at the concentration studied. Therefore, higher concentrations of oils are effective for the inhibition of these microorganisms. Since , Hammad and Youssef (1994) found that essential oil of garlic even at very low concentrations, had a greater inhibitory action against all test fungi and particularly against A. niger which was very sensitive to garlic oil.

Recently, garlic extract has been shown to have inhibitory action against several fungal species including some that cause mycosis (Moore and Atkins, 1977) and other which produce aflatoxins such as *Aspergillus Flavus* and *A. parasiticus* (Sharma *et al*., 1981 a & 1981b). In Egypt. El-Shami *et al*. (1985) studied the effect of garlic clove juice, in comparison with the use of five fungicides, on spore germination and linear growth of water melon with pathogen (*Fusarium oxysporm* and *F. niveum*). They observed complete inhibition of fungal growth when garlic juice was added.

It could be concluded that there is a relationship between onion and /or garlic with rumen microbes and however, there effect on nutrients digestibility still need further studies. From the previous results, it could be concluded that the natural supplements (onion and/or garlic) in its fresh form could enhance the utilization of dietary protein particularly with garlic supplementation.

This conclusion is based on the results of dietary nitrogen utilization which was higher ($P \leq 0.05$) with garlic supplement (Table 2). Results of ruminal $NH_3$-N concentration after 3-hrs of feeding also showed higher ($P < 0.05$) values than control . The microbial yield in the rumen was increased by nearly two times than control and the nitrogenous substances of blood serum confirmed the previous results, since there were no deleterious effect of different supplements on measured blood parameters, particularly, urea and creatinine.

Therefore, it's a target necessary to give more attention for the effect of natural supplements in practical feeding of ruminants.

Table (7) showed that the diet supplemented with remainder fresh onion, garlic and onion + garlic had higher economical efficiency (Kg DM/Kg gain) than that of the control . In relative value to control, the efficiency was increased by 15.7, 15.8 and 19.1% for onion, garlic and/or onion + garlic supplements , respectively. Therefore , its concluded that garlic + onion supplements improved feed conversion as DMI /Kg growth, reduced the total feeding cost kg growth and currently improved the net return of experimental rations with natural supplements.

It seems likely, that both onion and garlic could be used to promote growth performance and improve feed conversion in lower feeding costs for growing local goats.

**Table 7: Economical evaluation of the tested diet**

| Item | Experimental rations | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Price of Kg DM of diet, L.E | 0.56 | 0.530 | 0.54 | 0.540 |
| DMI for /Kg growth | 10.38 | 9.26 | 8.93 | 8.71 |
| Total cost/Kg growth, L.E | 5.81 | 4.90 | 4.89 | 4.70 |
| Net return of experimental ration as % of control | 0.00 | 15.7 | 15.8 | 19.1 |

**Price of Kg of CFM, fresh onion and fresh garlic were 0.56, 0.06 and 0.20 L.E., respectively during 1999**

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## تأثير إضافات النباتات الطبيعية فى العلائق على أداء الماعز البلدية النامية

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تم فى هذه الدراسة استخدام ١٦ ذكر ماعز بلدى بمتوسط وزن ٢٠,٢كم قسمت إلى أربعة مجاميع بهدف دراسة تأثير إضافة بعض النباتات الطبيعية (البصل والثوم أو خليط من البصل والثوم الفرزة او السردة غير الصالح للإستخدام الأدمى) كمنشط طبيعى للنمو.
وكانت العلائق التجريبية الأربعة لكل مجموعة على النحو التالى :
I – مخلوط علف مركز.
II - مخلوط علف مركز + ٢٠٠٠ جم بصل طازج مقطع كإضافة غذائية .
III – مخلوط علف مركز + ٦٠٠ جم ثوم طازج مقطع كإضافة غذائية.
IV – مخلوط علف مركز + ١٠٠٠ جم بصل طازج مقطع + ٣٠٠ جم ثوم مقطع طازج .
وكانت التغذية جماعية لكل مجموعة حتى الشبع من العلائق التجريبية وقد استمرت التجربة لمدة ١٢٠ يوماً .
ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى :
1- حسنت العلائق المحتوية على الإضافات الغذائية معنويا معاملات هضم كلا من المادة العضوية والألياف الخام والدهن الخام والمستخلص الخالى من الأزوت عن عليقة المقارنة.
2- حسنت جميع الإضافات الغذائية المختلفة الاستفادة من نيتروجين العليقة ($P< 0.05$) بالنسبة للنيتروجين المأكول حيث كانت ٤٠,٨% ، ٤٢,٧% ، ٤٢,٦% للعلائق التجريبية ٢،٣،٤ على الترتيب عن عليقة المقارنة.
3- حسنت جميع الإضافات الغذائية معنويا القيمة الغذائية كمركبات كلية مهضومة عن عليقة المقارنة بنسبة ٧,٢ ، ٠٩,٩ ، ٦,٥% لكلا من العلائق ٢،٣،٤ على الترتيب وكانت الفروق معنوية بالنسبة للعليقة المحتوية على الثوم ولم يلاحظ وجود فروق معنوية فى البروتين الخام المهضوم لكلا من العلائق التجريبية المختلفة.
4- حسنت جميع الإضافات الغذائية معدلات النمو اليومية وكفاءة التحويل الغذائى ( كحم مادة جافة ١كجم نمو ) بنسبة ١٠,٥% ، ١٥,٨% ، ١٣,١% ، ١٠,٧% ، ١٣,٩% و ١٦,٠% على الترتيب لكلا من العلائق ٢،٣،٤ على الترتيب عن عليقة المقارنة. ولكن تلك الفروق بين المجموعات لم تكن معنوية .
5- لم تلاحظ فروق معنوية بين المجموعات الأربعة بالنسبة (لتركيز أيون الأيدروجين، ونيتروجين الأمونيا والأحماض الدهنية الطيارة) فى سائل كرش الماعز لجميع الإضافات الغذائية قبل التغذية عن عليقة المقارنة ، بينما حسنت جميع الإضافات الغذائية معنويا أمونيا النيتروجين وكذلك الأحماض الدهنية الطيارة لسائل كرش الحيوانات عن عليقة المقارنة بعد ٣ ساعات من التغذية .
6- لوحظ أن الإضافات الغذائية أدت إلى خفض معنوى ($P<0.05$) لكل من الكوليسترول والتراجلسرايد فى دم الحيوانات المغذاة على الاضافات الغذائية ، بينما لم تلاحظ فروق معنوية بين المجموعات الأربعة بالنسبة للبروتين الكلى الألبيومين، الجلوبيولين ، اليوريا ، الكرياتينين فى دم الحيوانات عن عليقة المقارنة .
7- حسنت الإضافات الغذائية المختلفة أعداد الكائنات الحية فى سائل كرش الحيوانات التجريبية لأنواع البكتريا المحللة للسيلبلوز والنشا وكذلك البكتريا المحللة للبروتين والدهن وكذلك المنتجة للميثان والالكتو باسيلاى ، والاستربتوكوكاى والاكتينومايسيس والبروتوزوا عن تلك المغذاه على عليقة المقارنة بينما انخفض عدد الفطريات بواسطة الإضافات الغذائية المختلفة عن عليقة المقارنة.
ويستخلص من هذه الدراسة امكانية استخدام البصل والثوم الفرزة أو السردة الطازج أو خليط منهما فى علائق الماعز المحلية النامية كإضافة غذائية تحسن معدل النمو والتحويل الغذائى وكذلك تحسن العائد الاقتصادى الذى يتراوح بين ١٥ –١٩% من تكلفة العليقة .