A POSSIBILITY TO IMPROVE IODINE AND SELENIUM CONTENT IN THE MEAT OF KACANG GOATS

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Abstract – The study was conducted to examine the effects of supplementing inorganic Se, I and a combination of both on their retention levels in serum, skeletal muscle and organs of 24 meat goats. Animals were selected randomly and allotted to basal diet without supplementation (background only) as control (T1), basal diet + 0.6 mg Se/kg DM (T2), basal diet + 0.6 mg I/kg DM (T3) or basal diet with combination of 0.6 mg Se +0.6 mg I/kg DM (T4) for 100 consecutive days. Serum samples were collected at days 0, 30, 60 and 95 for the determination of Se and I concentrations. *Longissimus dorsi* muscle, liver and kidney werealso collected, vacuum packaged and stored frozen until assayed for the Se and I levels. In comparison with the control animals (T1), the levels of both elements were elevated (p<0.05) in the serum. Higher concentrations of Se and I in the LD, kidney and liver (p<0.05) were also shown by the supplemented animals (T2, T3 and T4). It can be concluded that the Se and I dietary supplementation employed in this study has resulted in higher content of both elements in the serum, muscle, liver and kidney.

Key Words –chevon, elements, goat meat, retention

I. INTRODUCTION

Goat meat (chevon) has been universally accepted by different cultures [1] and it contains less fat compared to other types of red meat which are also preferable in the western diets [2]. The physiological functions of trace elements, particularly their role on metabolic and protective processes make them crucial for the nutrition of human and animal. It is necessary to supplement trace elements to animal feed up to the required level because of their low native dietary concentrations [3]. As far as livestock products are concerned, in most parts of the world, milk has been regarded as the main source of these elements. Alternatively, selenium (Se) and iodine (I) can also be obtained through meat consumption. Studies in pigs [4] bulls [5] and broiler chicken [6] have demonstrated that I supplementation resulted in higher I levels in their blood, muscle and organs. Kaufmann and Rambeck [7] reported that despite its inferior effectiveness, the carry-over of I into meat is feasible. Previous studies [8, 9] indicated that Se supplementation with different levels and source reflected a positive response on its concentration in muscle tissue. There are still selenium [10] and iodine [7] deficiencies in many populations, which justify continuous efforts to increase these two trace elements in food such as eggs, milk and meat through fortification of compound animal feeds with selenium and iodine.Therefore, this study was conducted to examine the effects of supplementing inorganic Se, I and a combination of both on their retention levels in serum, muscle and organs of goats.

II. MATERIALS AND METHODS

The study was conducted on 24 local Kacang crossbred male goats aged at 7- 8 months old with mean initial body weight 22 ± 1.17kg. The animals were randomly assigned to 4 dietary treatments: T1 (control) basal diet without supplementation (background only) ; T2 - basal diet with 0.6 mg Se/kg DM; T3 - basal diet with 0.6 mg I/kg DM; T4 - basal diet with combination of 0.6 mg Se and 0.6 I/kg DM. The supplementation levels of Se and I chosen in this experiment are twice higher than the levels recommended by the National Research Council [11] at which would be safe for the animals in term of toxicity. The inorganic Se and I were given in the form of Na selenite and K iodide, respectively. Blood samples were collected via jugular venipuncture at days 0, 30, 60 and 95 of the feeding trial, centrifuged, and the harvested serum was frozen at −20°C until subsequent analysis. The animals were slaughtered and samples of *longissimus dorsi* (LD) muscle, liver and kidney were collected, vacuum packaged and stored frozen for minerals retention measurements. Inductively Coupled Plasma – Mass Spectrometry (ELAN DRC-e Perkin Elmer, Canada, 2008) was used to determine I and Se concentrations in the LD, liver and kidney [12] and serum [13]. The data were statistically analyzed using the GLM procedure of SAS Version 9.2 software (Statistical Analysis System, SAS Institute Inc., Cary, NC, USA) and statistical significance was set at $p < 0.05$ for one-way analysis of variance (ANOVA). Repeated measurement in time was used for Se and I concentrations in the serum. Differences between the means were determined by Duncan's multiple range test.

III. RESULTS AND DISCUSSION

In comparison with T1 and T3, higher concentration of Se was indicated by the LD muscle and kidney of T2 and T4 animals (Table 1). In the liver, a significant elevation in Se concentration was noted in the T4 group but only in comparison with the T3. Skrivanova *et al* [14] indicated that the response in Se deposition to dietary supplementation is tissue-dependent. In this study, the I contents in the LD muscle, liver and kidney of T3 goats were significantly higher than those from the T1 (control) and T2 groups. The content of Se and I in LD, liver and kidney of T4 animals (Se + I) was markedly increased (Table 1). However, I content of LD was 2-fold higher than control. The total content of Se and I in the LD muscle, liver and kidney of the T4 animals were almost similar compared to the animals of T3 and T2, respectively. In pigs, Schone *et al* [15] postulated that the limitation of I accumulation in the meat could be explained by unequal distribution of the element in the body with the highest content normally presented by the thyroid gland.

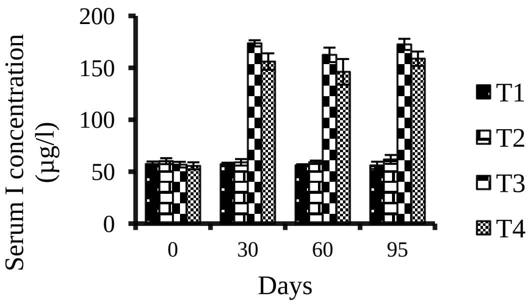
Table 1. Concentrations of Se (mg/kg) and I (µg/kg) in LD muscle, liver and kidney of goats fed different dietary treatments.

	Dietary treatments‡				
	T1	T2	T3	T4	SEM
Se(mg/kg)					
LD	0.47^{b}	0.83^{a}	0.49^{b}	0.73^{a}	0.04
Liver	0.79^{ab}	0.87^{ab}	0.65^{b}	0.94^{a}	0.07
Kidney	0.95^{b}	1.73^{a}	0.93^{b}	1.64^{a}	0.08
I (µg/kg)					
LD	4.50^{b}	4.50^{b}	17.20^{a}	10.40^{ab}	3.79
Liver	2.80^{b}	3.85^{b}	32.85^{a}	29.50^{a}	3.52
Kidney	4.00^{b}	4.80^{b}	51.10^{a}	40.55^{a}	5.95

‡T1: [control, basal diet without supplementation (background only)];
T2: basal diet + 0.6 mg Se/kg DM;
T3: basal diet + 0.6 mg I/kg DM;
T4: basal diet + (0.6 mg Se/kg DM+0.6 mg I/kg DM)
abcLeast- square means with different superscripts within the same row differ significantly (p<0.05).
SEM, Standard error of means

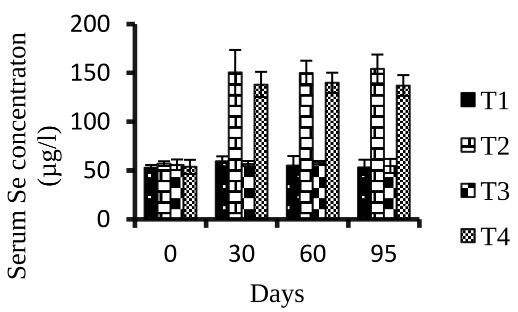
The Se and I concentrations in serum of the animals supplemented with either I (T3) or Se (T2) or combination of both (T4) were higher (p<0.05) than those in the control group (T1)(Figure 1, Figure 2). The differences were observed at day 30 of the feeding trial. However, there were no further increase in Se and I concentrations at days 60 and 95 of the experiment. This suggests that both I and Se could have attained their steady state at day 30 of the experiment. The supranutritional supplementations of I and Se for 30 consecutive days may have triggered homeostasis of serum I and Se through absorption, distribution, activities and secretion. The remaining period of feeding could have allowed minerals to accumulate in the organs and muscles. Zachara *et al* [16] reported that plasma Se concentration in the sheep treated with dietary Se level of 0.58 mg/kg DM have reached steady state after 32 days of the experimental feeding. Stockdale and Gill [17] reported that Se continued to be present in the blood for at least 4 months after withdrawal of supplementation and this period could be affected by the amount and duration of the supplementation.

Figure 1.Serum iodine concentration (µg/l) in goats fed different dietary treatments.



T1:[control, basal diet without supplementation (background only)];
T2: basal diet+ 0.6 mg Se/kg DM;
T3: basal diet+ 0.6 mg I/kg DM;
T4: basal diet+ (0.6 mg Se/kg DM+0.6 mg I/kg DM

Figure 2.Serum selenium concentration (µg/l) in goats fed different dietary treatments.



T1:[control, basal diet without supplementation (background only)];
T2: basaldiet+ 0.6 mg Se/kg DM;
T3:basal diet+ 0.6 mg I/kg DM;
T4:basaldiet+ (0.6 mg Se/kg DM+0.6 mg I/kg DM

IV. CONCLUSION

The results of this study highlight the potential of supplementation of Se and I at the level of 0.6 mg/kg DM as a dietary intervention to increase their contents in the blood, muscle, liver and kidney. The increased Se in LD muscle, liver and kidney may positively impact human nutrition. However, chevon has to be classified as a low iodine food to daily human requirement. The findings generated through this study may also provide a scientific basis for future works on meat eating quality.

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