



**Influence of potassium iodide salts supplementation on rumen fermentation parameters, thyroid gland hormones, blood constituents and body weight gain in goats in Egypt.**

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**Abstract**

The present study was carried out to investigate the influence of addition of potassium iodide salts on rumen function, thyroid hormones Triiodothyronine (T3), Thyroxine (T4), thyroid stimulating hormone (TSH), body weight gain, blood cellular constituent and serum biochemical constituents in goats in Egypt. Fifteen fattening goats belonging to: farm of Faculty of Agriculture, Cairo University were divided as: Control group (8) only in measurement of body weight gain and experimental group (7). In all other parameters; experimental group at zero day was the control. Their ages ranged between (6-11 months) in experimental group and (8-9 months) in control group. This study extended to about 2 months at (zero, 15, 30 and 65 days). Goats drank potassium iodide dissolved in distilled water in the morning with dose 3.8 mg. KI / animal / day. Significant increase in body weight gain and variable significant decrease in T3 and T4 hormones indicating they were still in normal range, changes in blood urea nitrogen and glucose level and changes in hematological parameters.

**Key words** : (Fattening goats –Thyroid hormones- Rumen – Blood hematology – Blood biochemistry – Body weight gain)

**Introduction:**

Thyroid gland formed from two lobes connected with isthmus occupying the first tracheal ring in goats. Main function of the thyroid gland is the production of thyroid hormones (triiodothyronine (T3), Thyroxine (T4), thyroid stimulating hormone (TSH). Thyroid hormones crucial affect the whole metabolism of animal. Iodine intake from the environment is the critical factor; which influences function of the thyroid gland (Palka et al., 2013).

Thyroid hormones influence production (milk yield, intensity of growth, wool growth) and reproduction of animals (Pugh and Baird, 2012).

Animal iodine intake has a positive effect on thyroid gland productivity of thyroidal hormones.

Iodine is a micro element which is taken by animal in traces. Iodine deficiency is resulting in deficiency of thyroid hormones production which affects animal metabolism and growth (Peksa et al, 2013)

**Materials and methods**

**Materials:**

**Animals:**

A total number of (15) of fattening goats belonging to: farm of Agriculture College were divided as: Control group (8) and experimental group (7).

They were ranged between (6-11 months) in experimental group and (8-9 months) of age in control group.

They were fed: yellow corn, soya bean, sunflower and wheat bran with chemical analysis as in Table (1) and premix with chemical composition as in Table (2).

**Table No. (1) : Chemical composition of the experimental ration :**

Ingredient	%
Fat %	3.22
Fibers %	5.69
Moisture%	10.3
Ash%	4.4
Protein%	15.8

**Table No. (2) Chemical composition of premix:**

Ingredient	%
Ca. %	33.68
Na %	13.28
Ph	ND
K (mg/kg)	177.8

**Samples:**

**Rumen juice samples:**

Fifty ml of rumen juice was collected using rubber stomach tube at morning.

Sample was examined immediately for physical characters: PH, Protozoal activity, Total protozoal examination after fixation using methyl green fixation solution for. After sieving into two portions was divided into: First portion (2ml) for determination of ammonia nitrogen level after preservation by adding liquid paraffin oil, the second for total volatile fatty acids (2 ml) after preservation by adding 2ml ortho phosphoric acid and 1ml hydrochloric acid N/10.

**Blood samples:**

Blood samples were collected from jugular vein and divided into 2 portions. The first (10ml) of blood in a clean dry centrifuge tube for collection of clean non-hemolyzed serum for determination the level of total sodium, potassium, chloride, calcium, inorganic phosphorus, glucose, blood urea nitrogen, creatinine, T3 and T4. The second was collected in a vacutainer tube containing 0.2 ml EDTA for determination of packed cell volume, blood haemoglobin, red blood cells, white blood cells count, differential leucocytic count and blood indices.

#### Chemicals:

**Potassium Iodide salt** manufactured by El Gomhoreya Pharmaceuticals and Medical Supplies (Egypt). Available in jars 250 mg.

#### Methods:

##### Clinical examination:

Each animal was subjected to have a complete comprehensive clinical examination procedures including description, general inspection, pulse, temperature, respiratory rate, mucous membrane, lymph nodes, ruminal movement and parasitological examination.

##### Rumen fluid analysis:

##### Determination of rumen fluid physical properties:

The rumen fluid color, odor, consistency according to (Blood, *et al.*, 1983) and protozoal activity were determined immediately after collection of fluids according to (El-Saifi, 1969).

##### Determination of total protozoal count:

According to (Dehorety, 1984).

**Determination of rumen fluid PH:** Using portable pH meter.

**Determination of rumen ammonia nitrogen concentration:** According to the method described by (Conway 1957).

**Determination of total volatile fatty acids concentration (TVFA):** As described by (Warner, 1964).

##### Thyroidal hormones analysis :

**Determination of triiodothyronine hormone T3 and T4 :** Were estimated by solid phase time-resolved fluoroimmunoassay described by (Boland, T.M., 2008).

##### Blood cellular constituents:

**Determination of haemoglobin content (Hb), packed cell volume (P.C.V), red Blood Cell count (RBCs), blood indices (Mean corpuscular volume (MCV), mean**

**corpuscular hemoglobin (MCH) and mean corpuscular**

**hemoglobin concentration (MCHC) and total and differential White Blood Cell count (WBCs) :** were determined by the method described by Schalm (1986).

**Determination of serum sodium, potassium, serum alkaline phosphatase, blood urea nitrogen, serum calcium, inorganic phosphorus, serum glucose and serum creatinine :**

were determined using the method described by (Henry, *et al.* 1974), (Belfield, A. and Goldberg, D.M. 1971), Friedman and Young, (1997), Young, *et al.* (2001), (Trinder, p. 1969) and Brod (1984) using specific kits (Colorimetric method) produced by Bio diagnostic company, Egypt.

##### Body weight gain:

Body weight gain was estimated using ordinary balance by KG

##### Statistical analysis:

The obtained data were analyzed statistically by using SPSS program. Version 16. Test used for analysis of obtained results is Repeated Measures ANOVA.



## Results

### Physical and clinical examination of apparently healthy fattening goats:

Fifteen apparently healthy fattening goats were exposed to comprehensive clinical examination

including: temperature, pulse rate, respiratory rate and rumen motility, as showed in Table (3).

**Table (3) :** Temperature, pulse rate, respiratory rate and rumen motility of normal and healthy fattening goats :

Parameters	Minimum	Maximum	Mean±SE
Temperature (°C)	38.5	39.8	39.10±0.51
Pulse rate (/min.)	23	28	26.21±3.82
Respiratory rate(/min.)	70	83	79.81±8.62
Ruminalmotility(/2min.)	1	2	1.63±0.20

**Table (4):** Effect of addition of potassium iodide salts rumen parameters of experimental fattening goats in different times:

Parameters	At zero day(cont rol)	At 15 days	At 30 days	At 65 days
TPC (×10 <sup>4</sup> /ml.)	34.71±3.85 <sup>a</sup>	81.42±14.33 <sup>b</sup>	33.57±3.03 <sup>a</sup>	29.28±1.70 <sup>c</sup>
PH	6.9±0.11 <sup>a</sup>	6.85±0.11 <sup>b</sup>	6.87±0.08 <sup>b</sup>	7.21±0.03 <sup>c</sup>
TVFs (mmol/l.)	44.64±8.86 <sup>a</sup>	61.57±4.84 <sup>ab</sup>	71.50±4.07 <sup>b</sup>	65.28±3.69 <sup>ab</sup>
Ammonia(m g/dl)	311±10.29 <sup>a</sup>	175±34.69 <sup>cb</sup>	130±12.15 <sup>b</sup>	97.55±10.29 <sup>c</sup>

Means with different super scripts are significantly different at p≤0.05.

a,b,c : significant changes.

ab,cb : non significant changes .

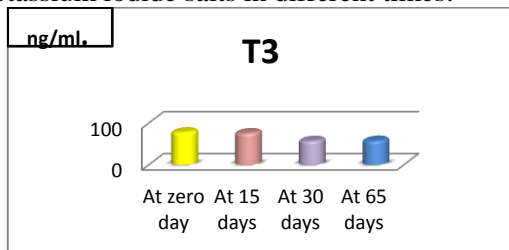
**Table (5):** Effect of addition of potassium iodide salts on thyroid parameters of experimental fattening goats in different times:

Parameters	At zero day (control)	At 15 days	At 30 days	At 65 days
T3 (ng/ml.)	78.17±4.02 <sup>a</sup>	76.25±3.41 <sup>a</sup>	57.81±4.21 <sup>b</sup>	57.95±2.93 <sup>b</sup>
T4 (ng/ml.)	5.67±0.29 <sup>a</sup>	5.77±0.29 <sup>a</sup>	4.08±0.31 <sup>b</sup>	4.17±22 <sup>b</sup>

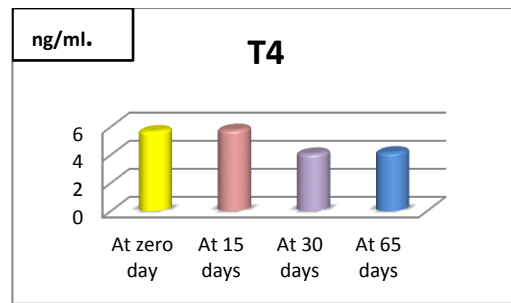
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**Fig.No. (1):** T3 (ng/ml.) Of experimental fattening goats under effect of addition of potassium iodide salts in different times:



**Fig. No. (2) :** T4 (ng/ml.) of experimental fattening goats under effect of addition of potassium iodide salts in different time :



**Table (6):** Effect of addition of potassium iodide salts on hematological parameters of experimental fattening goats in different times:

Parameters	At zero day(control)	At 15 days	At 30 days	At 65 days
Hb.(gm/dl.)	9.52±0.65 <sup>a</sup>	13.08±0.57 <sup>b</sup>	11.41±0.53 <sup>b</sup>	12.09±0.22 <sup>b</sup>
Pcv (%)	30.40±0.92 <sup>a</sup>	37.40±1.28 <sup>cb</sup>	33.20±1.49 <sup>b</sup>	35.40±0.87 <sup>c</sup>
RBCs(×10 <sup>6</sup> )	5.14±0.16 <sup>a</sup>	6.85±0.23 <sup>b</sup>	13.47±0.61 <sup>c</sup>	14.99±0.68 <sup>d</sup>
Mcv(fl)	5.90±0.10 <sup>a</sup>	5.45±0.00 <sup>a</sup>	2.46±0.00 <sup>b</sup>	2.36±0.05 <sup>b</sup>
MCH (pg)	1.82±0.07 <sup>a</sup>	1.86±0.02 <sup>a</sup>	.84±0.05 <sup>b</sup>	.80±0.02 <sup>b</sup>
MCHC (%)	.30±0.01 <sup>a</sup>	.34±0.002 <sup>a</sup>	.33±0.003 <sup>a</sup>	.33±0.005 <sup>a</sup>
WBCs(×10 <sup>3</sup> )	13.56±0.65 <sup>b</sup>	15.04±0.64 <sup>b</sup>	16.62±0.94 <sup>b</sup>	18.54±0.91 <sup>d</sup>

Means with different super scripts are significantly different at p≤0.05.

a, b, c,d : significant changes.

cb : non significant changes.

**Table (7):** Effect of addition of potassium iodide salts on biochemical parameters of experimental fattening goats in different times :

Parameters	At zero day(control)	At 15 days	At 30 days	At 65 days
Na	147±2.17 <sup>a</sup>	147±2.11 <sup>a</sup>	149±1.72 <sup>a</sup>	145±2.68 <sup>a</sup>
K	6.64±0.27 <sup>a</sup>	6.30±0.69 <sup>a</sup>	6.94±0.53 <sup>a</sup>	6.44±0.47 <sup>a</sup>
ALP	195±44.66 <sup>a</sup>	129±17.03 <sup>a</sup>	185±36.12 <sup>a</sup>	192±50.89 <sup>a</sup>
Ca	9.45±0.38 <sup>a</sup>	9.91±0.55 <sup>a</sup>	9.21±0.37 <sup>a</sup>	9.75±0.51 <sup>a</sup>
Ph	7.97±0.53 <sup>a</sup>	7.71±0.59 <sup>a</sup>	7.15±0.77 <sup>a</sup>	7.81±0.69 <sup>a</sup>
Cr	2.34±0.28 <sup>a</sup>	2.08±0.14 <sup>a</sup>	2.31±0.23 <sup>a</sup>	2.18±0.28 <sup>a</sup>
BUN	16.81±2.41 <sup>a</sup>	7.30±2.33 <sup>b</sup>	5.40±0.32 <sup>b</sup>	4.34±0.52 <sup>c</sup>
Glu.	77.10±1.29 <sup>a</sup>	90.30±2.48 <sup>b</sup>	77.27±3.53 <sup>ab</sup>	80.42±6.36 <sup>ab</sup>

Means with different super scripts are significantly different at p≤0.05.

a,b : significant changes

ab,cb : non significant changes

**Table (8) :** Effect of addition of potassium iodide salts on body weight gain of experimental fattening goats in different times :

Parameters	At zero day (control)	At 15 days	At 30 days	At 45 days	At 65 days
Bwt. Exp.	22.64±0.80 <sup>a</sup>	26.28±0.87 <sup>b</sup>	28.78±1.02 <sup>c</sup>	30.21±1.10 <sup>d</sup>	31.50±1.23 <sup>e</sup>

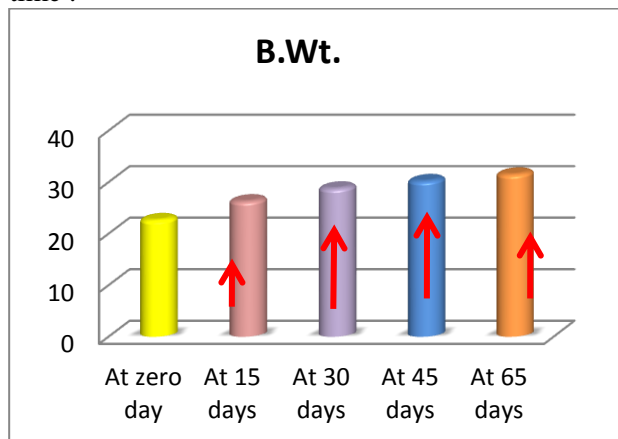
Means with different super scripts are significantly different at  $p \leq 0.05$ .

a,b,c,d,e : significant changes .

Table (9) : Body weight gain of control fattening goats in different times :

Parameters	At zero day	At 15 days	At 30 days
Bwt. Exp.	21.5	21.05	27.43

Fig. No. (3) : Body weight (kg.) of experimental fattening goats under effect of addition of potassium iodide salts in different time :



Significant increase in body weight gain may be due to addition of potassium iodide salts .

### Discussion

The mean values of physical clinical examination including: temperature, pulse rate, respiratory rate and rumen motility. of apparently healthy fattening goats indicating that animals were healthy and normal as tabulated in Table (3) .These findings were in agreement with (Al-Haidary, 2004) and (Sulaiman et al., 2009).

Physical examination of rumen juice from apparently healthy fattening goats indicating that there was increase in total protozoal count at 15 and 30 days with increase in total volatile fatty acids and decrease in ammonia level . This may be due to changes in pH to acidic side at 15 and 30 days and to alkaline side at 65 days as in Table(4). Ruminant juice pH were nearly to

that reported by (Salman et al. 2008) and (Pagkoum et al. (2009) ,

The mean values of T3 &T4 hormones conc. in serum obtained from apparently healthy fattening goats indicating significant in T3 and T4 level and still in the normal level due to saving of daily requirements of iodine in the form of KI which achieve a good storage in the accini of the gland as in Table (5) .These findings were in agreement was with(Polat et al. 2014) .

Hematological blood constituents of apparently healthy fattening goats indicating improvements in levels of Hb., PCV, RBCs and WBCs which may be due to addition of potassium iodide salts as in Table (6). These findings were in agreement with Al-Haidary , (2004) and (Sulaiman et al. 2009).

Serum biochemical constituents of apparently healthy fattening goats indicating no changes in biochemical parameters except BUN and glucose level may be due to improvements in rumen function and metabolism when potassium iodide was added as in Table (7). These findings were in agreement was with(El Manyaw et al. 2010 ) and Piccione et al. (2010) .

The mean values of body weight (kg.) of apparently healthy fattening goats indicating increase in body weight gain through times of 15, 30,45 and 65 days due to increase rumen function and metabolism when potassium iodide was added as in Table (8) .These findings were in agreement with(Baffour-Awuah et al. 2000) , (Slippers et al. 2000) and Salem et al (1990) and Rajendran et al. (2001).

### Conclusions

Due to addition of potassium iodide salts to goats , rumen function parameters : there was changes in PH and ammonia level.

Thyroid hormones (T3 and T4 ) little decreased from the starting point b Hematological parameters changes in some points as Hb, PCV, RBCs , MCV and MCH but still in the normal level.

No biochemical changes except in blood urea nitrogen and glucose level.

There was significant increase in body weight gain which estimates over 15, 30, 45 and 65 days.

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