Bulgarian Journal of Veterinary Medicine (2013), **16**, No 1, 48–52

Short communication

EFFECTS OF LONDON ROCKET (*SISYMBRIUM IRIO*) ON GOATS' HEALTH: CLINICAL AND LABORATORY STUDIES

A. M. AL-MUJALLI[1], T. A. FOUDA[1, 2] & H. A. HUSSEIN[1]

[1]Department of Clinical Studies, College of Veterinary Medicine & Animal Resources, King Faisal University, KSA; [2]Department of Medicine & Infectious Diseases, College of Veterinary Medicine, Mansoura University, Mansoura, Egypt

Summary

Al-Mujalli, A. M., T. A. Fouda & H. A. Hussein, 2013. Effects of London rocket (*Sisymbrium irio*) on goats' health: Clinical and laboratory studies. *Bulg. J. Vet. Med.*, **16**, No 1, 48–52.

The study was conducted to investigate the effects of London rocket (*Sisymbrium irio*) on the general health status of goats from one side and on the blood cellular and biochemical parameters from the other. Six native breed goats, 2–3 years old, weighing 35–40 kg were fed daily on 10 g/kg body weight of fresh whole plant material of London rocket (*Sisymbrium irio*) for five weeks. Blood samples were obtained from all animals on a weekly basis and were subjected to laboratory evaluation. Two goats were euthanised and *post mortem* examination was carried out. The obtained results revealed a slight effect on the general health status of the animals and no abnormal macroscopic lesions on *post mortem* examination. Blood biochemical analysis revealed significant elevations ($P<0.05$) in the mean values of alanine aminotransferase, aspartate aminotransferase, urea, magnesium, total protein and albumin starting from the third week of *S. irio* supplementation. Also, the results revealed non-significant changes in the mean inorganic phosphate, calcium, glucose, creatinine and uric acid concentrations compared to healthy controls. Haematological evaluation revealed significantly ($P<0.05$) higher total white blood cell counts and granulocytes starting from the third week of *S. irio* feeding. Significant ($P<0.05$) reductions in the mean red blood cell and lymphocyte counts were reported. It could be concluded that *Sisymbrium irio* altered blood biochemical and haematological parameters which may result in adverse effects on goats' health. However this assumption should be supported by further investigations.

Key words: blood biochemistry, goats, haematology, *Sisymbrium irio*

The London rocket (*Sisymbrium irio*) is an annual herbal plant from the Cruciferae family (Everitt *et al.,* 2007). The plant is a rich source of flavoinoids and glucosinolates (Al-Qudah & Abu Zarga, 2010). The chemical constituents of the aerial parts of the plant had been analysed in Jordan (Al-Qudah & Abu Zarga, 2010). The authors found that the major constituents were dioctyladipate, N-(n-proyl) acetamide, isopropyl isothiocyanate, isobutyl isothiocyanate, tetramethyl-2-hexadecen-1-ol, eicosatrienoic acid, heptacosane, palmitic acid, n-butyl isothiocyanate

and dimethoxyacetophenone. The plant is distributed in several countries of the Middle East including Saudi Arabia particularly in the areas where the camels, sheep and goats are raised. It is used to treat coughs and chest congestion, to relieve rheumatism, to detoxify the liver and the spleen, and to reduce swelling and clean wounds. It has analgesic, antipyretic and antimicrobial effects (Bailey *et al.,* 1981).

Polioencephalomalacia was diagnosed histologically in cattle from two herds on the Darling Downs, Queensland, Australia. Eight out of twenty 18-month-old Aberdeen Angus steers died while grazing on pastures comprising 60% London rocket (*S. irio*) and 40% shepherd's purse (*Capsella bursapastoris*). The affected animals were either found dead or comatose or were apparently blind and head-pressing in some cases (McKenzie *et al.,* 2009). The seeds of *S. irio* were also reported active against *E. coli*, *S. aureus* and *B. subtilis*. Surprisingly, the plant was not effective against *S. typhi*, although it is one of the most preferable drugs in Unani system of medicine, and widely used for its antipyretic action in typhoid and influenza (Ashfaque *et al.*, 2011). The strong inhibition against *S. aureus* certainly favours its indiscriminate use in the treatment of bacterial infections usually accompanied by high fever (Ashfaque *et al.,* 2011). The seeds of the London rocket are used for the treatment of inflammatory conditions, boils, pimples, cough, cholera and non-specific fever. Crude extracts of the seeds were tested for antipyretic, analgesic and antimicrobial effects. The ethanolic extract exhibited significant antipyretic and analgesic effects as well. It also exhibited marked antibacterial action against both Gram-positive and Gram-negative organisms and was found to be nontoxic in acute studies (Vohra *et al*., 1980).

As the London rocket could represent a risk or constraint on health of grazing animals, especially in northern and eastern parts of the Saudia Arabia, the main objective of this study was to investigate the effects of the plant on the general health status of goats from one side and its possible effects on the blood cells and blood biochemical parameters from the other.

Six native breed goats, 2–3 years old, weighing between 35–40 kg were used for this experiment. The animals were kept under close observation for one week before the experiment's start at the Veterinary Teaching Hospital, Agriculture and Veterinary Research Station, King Faisal University. The animals were subjected to physical examination and blood samples were obtained in the adaptation period. Then, they were fed on 10 g/kg body weight London rocket (*Sisymbrium irio*) as native whole plant material daily for five weeks.

Blood samples were obtained from all animals (weekly) and were subjected to laboratory evaluation. Two blood samples were obtained from each animal through jugular venipuncture. The first sample was obtained in vaccutainer tubes with EDTA as anticoagulant and were used for complete blood cell counts using the electronic cell counter (UDIHEM-UDI). The second sample were obtained in plain vaccutainer tubes and was used for obtaining serum for biochemical analysis. The concentrations of the selected biochemical parameters were measured colorimetrically using Ellipse-UDI machine. In addition, two goats were euthanised and *post mortem* examination was carried out.

Data were analysed by the general linear model (GLM) procedure (SAS Institute Inc, 1996). The least square mean

(LSM) + standard errors were calculated and tested for significance. Significance of the effects was tested at P<0.05 level with the appropriate *F* statistics (Steel & Torrie, 1960).

The results of this experiment revealed that feeding the goats on London rocket for five weeks did not show any adverse effects on the general health status of the animals except for varying degrees of loss of appetite and slight depression when compared to their health condition before the experiment. The *post mortem* examination showed only slight congestion of gastrointestinal tract of the two necropsied goats.

Blood biochemical analysis revealed significant (P<0.05) elevations in the mean values of ALAT (29.03±1.57 U/L), ASAT (71.55±3.33 U/L), urea (13.60± 0.16 mmol/l), magnesium (0.86±0.04 mmol/L), total protein (93.0±2.5 g/L) and albumin (37.8±1.6 g/L) on the third week after London rocket feeding compared to the respective control values. Meanwhile, the results revealed non-significant changes in calcium (1.45±0.09 mmol/L), inorganic phosphate (1.12±0.09 mmol/L), glucose (3.95±0.70 mmol/L), creatinine (42.43±14.14 μmol/L) and uric acid (0.03 ±0.004 mmol/L) concentrations vs baseline values.

Table 1. Changes in blood biochemical parameters in goats before and after *Sisymbrium irio* dietary supplementation for 5 weeks. Data are presented as mean ± SEM, n=6.

Parameters	Before the experiment	Weeks after *S. irio* supplementation				
		1	2	3	4	5
Total protein, g/L	63.2 [a] ± 2.6	69.7 [a] ± 4.0	92.0 [b] ± 2.5	93.0 [b] ± 2.5	92.2 [b] ± 2.6	95.5 [b] ± 1.5
Albumin, g/L	28.7 [a] ± 2.1	31.8 [ac] ± 2.1	36.7 [bc] ± 1.7	37.8 [b] ± 1.6	37.0 [b] ± 1.9	37.7 [b] ± 1.9
BUN, mmol/L	3.72 [a] ± 0.34	4.04 [a] ± 0.32	4.82 [b] ±0.05	4.85 [b] ±0.06	5.19 [b] ±0.05	4.79 [b] ±0.45
Creatinine, μmol/l	35.36 [a] ± 10.60	55.69 [a] ± 7.07	35.36 [a] ± 15.02	42.43 [a] ± 14.14	41.54 [a] ± 15.91	45.96 [a] ± 13.26
ALT, U/L	13.88 [a] ± 1.44	18.83 [b] ± 2.96	24.02 [c] ± 1.21	29.03 [de] ± 1.57	27.42 [ce] ± 0.98	27.75 [ce] ± 0.90
AST, U/L	62.65 [a] ± 3.86	63.48 [acd] ± 2.42	69.17 [ac] ± 2.56	71.55 [bc] ± 3.33	72.07 [bc] ± 3.14	74.42 [bce] ± 2.32
Magnesium, mmol/L	0.64 [ac] ± 0.10	0.75 [bc] ± 0.04	0.86 [b] ± 0.03	0.86 [b] ± 0.04	0.86 [b] ± 0.03	0.88 [b] ± 0.04
Inorganic P, mmol/l	1.14 [a] ± 0.06	1.15 [a] ± 0.06	1.06 [a] ± 0.06	1.12 [a] ± 0.09	1.10 [a] ± 0.08	1.19 [a] ± 0.08
Calcium, mmol/l	1.56 [a] ± 0.09	1.64 [ab] ± 0.06	1.37 [ac] ± 0.09	1.45 [a] ± 0.09	1.41 [ac] ± 0.07	1.42 [ac] ± 0.09
Glucose, mmol/l	4.32 [a] ± 0.40	4.31 [a] ± 0.41	4.58 [a] ± 0.12	3.95 [a] ± 0.70	4.60 [a] ± 0.11	4.73 [a] ± 0.09
Uric acid, mmol/l	0.03 [a] ± 0.009	0.03 [a] ± 0.007	0.03 [a] ± 0.001	0.03 [a] ± 0.004	0.04 [a] ± 0.001	0.04 [a] ± 0.008

[a ,b,c,d] Means with different superscripts in the row are significantly different (P<0.05).

Table 2. Changes in blood cellular parameters in goats before and after *Sisymbrium irio* dietary supplementation for 5 weeks. Data are presented as mean ± SEM, n=6.

Parameters	Before the experiment	Weeks after *S. irio* supplementation				
		1	2	3	4	5
Red blood cells, T/L	11.05 [a] ± 0.55	11.13 [a] ± 0.53	8.82 [b] ± 0.39	8.83 [b] ± 0.39	9.08 [b] ± 0.47	9.37 [b] ± 0.55
Haemoglobin, g/L	108.0 [a] ± 4.2	109.3 [a] ± 3.4	117.8 [a] ± 5.2	119.7 [a] ± 5.0	120.8 [a] ± 5.0	113.2 [a] ± 4.5
Haematocrit, %	35.78 [a] ± 1.20	36.97 [a] ± 1.05	36.93 [a] ± 1.10	37.83 [a] ± 1.22	38.53 [a] ± 1.09	38.90 [a] ± 1.03
White blood cells, G/L	8.67 [a] ± 0.47	8.62 [a] ± 0.46	15.70 [b] ± 1.21	15.93 [b] ± 1.18	16.78 [b] ± 1.18	16.90 [b] ± 0.94
Granulocytes, %	58.83 [a] ± 4.76	56.50 [ac] ± 2.87	67.83 [ad] ± 3.31	70.33 [bd] ± 3.05	68.00 [ad] ± 3.70	70.00 [bd] ± 3.39
Lymphocytes, %	33.33 [a] ± 2.16	33.67 [a] ± 2.55	26.67 [ac] ± 3.18	24.00 [bc] ± 3.15	26.50 [ac] ± 3.52	24.00 [bc] ± 2.77
Monocytes, %	10.83 [a] ± 3.89	9.83 [a] ± 2.20	5.50 [a] ± 0.81	5.67 [a] ± 0.80	5.50 [a] ± 0.81	6.17 [a] ± 0.70

[a,b,c,d] Means with different superscripts in the row are significantly different (P<0.05).

Such elevations in the mean liver enzymatic activities in animals fed on *S. irio* could be attributed to the effect of the plant on the hepatic cells and increased leakage of enzymes to serum which may result from the effect of euric acid. This acid could entail hepatic necrosis associated with mononuclear cell aggregation, Kupffer cell proliferation, hyaline droplet degeneration in hepatocytes, and extensive hepatitis (Hussein *et al.,* 2009). Also, as reported by Al-Qudah & Abu Zarga (2010) the oils found in the London rocket include seven acids and two esters (38.80%), 11 nitrogen and sulfur containing compounds (36.41%), 15 terpenoids (8.19%), 6 aliphatic hydrocarbons (6.29%), 5 aromatic compounds (3.53%), four fatty alcohols (2.49%) and 3 other compounds (1.17%).

Blood haematology revealed significantly (P<0.05) higher total white blood cell counts (15.70±1.21 G/L, 16.78±1.18 G/L, 16.90±0.94 G/L) and granulocyte percentages (67.83±3.31%, 70.33±3.05% and 70.00±3.39%) by the 3rd, 4th and 5th week of dietary *S. irio* intake compared to the control values (Table 2). At the same time, mean red blood cell counts (11.13±0.53 T/L, 8.82±0.39 T/L and 9.37±0.55 T/L) and lymphocyte percentages (26.67±3.18%, 24.00±3.15%, 24.00± 2.77%) were reduced vs baseline (P<0.05).

Increased total leukocyte counts in animals fed *S. irio* could be a response of the body to the active principles present in the plant, which can result in hepatitis and slight degree of nephrotoxic degeneration and inflammatory changes in the renal tubules (Hussein *et al.,* 2009). Meanwhile, reduced mean erythrocyte counts in these animals could be attributed to the haemolytic effects of the active principles in addition to the effects on the spleen (Hussein *et al.,* 2009).

It could be concluded from this study that feeding on London rocket *(Sisymbrium irio)* may result in some derangement in blood cells and biochemical constituents as a result of the effects of the

herbal active principles. Slight disturbances were observed in the physical activities of the animals. However, further studies are required to investigate in detail the effects on the animal health condition and blood profile.

REFERENCES

Al-Qudah, M. A. & M. H. Abu Zarga, 2010. Chemical composition of essential oils from aerial parts of *Sisymbrium irio* from Jordan. *E-Journal of Chemistry*, **7**, 6–10.

Ashfaque, K., M. R. Prakash, S. Ali, A. Aljarbou & M. A. Khan, 2011. Comparative study of antibacterial activity and toxicity of certain plants used in Unani medicine. *Advances in Bioresearch*, **2**, 10–13.

Bailey, C. & A. Danin, 1981. Bedouin plant utilization in Sinai and the Negev. *Economic Botany*, **35**, 145–162.

Everitt, J. H., R. L. Lonard & C. R. Little, 2007. Weeds in South Texas and Northern Mexico. Lubbock: Texas Tech University Press.

Hussein, Y. A., A. A. Hegazi, S. S. Al-Shokair & M. H. Al-Saqia, 2009. Toxico-pathological studies of the poisonous plant *Sisymbrium irio* in rats. In: *Proceedings of the 6th International Scientific Conference*, Mansoura University, Mansoura, Egypt.

McKenzie, R. A., A. M. Carmichael, M. L. Schibrowski, S. A. Duigan, J. A. Gibson & J. D. Taylor, 2009. Sulfur-associated polioencephalomalacia in cattle grazing plants in the family Brassicaceae. *The Australian Veterinary Journal,* **87**, 27–32.

Steel, R. G. D. & J. H. Torrie, 1960. Principles and procedure of statistics. Mc Graw-Hill Book Comp. Inc., New York, USA.

Vohora, S. B., S. A. Naqvi & I. Kumar, 1980. Antipyretic, analgesic and antimicrobial studies on *Sisymbrium irio*. *Planta Medica*, **38**, 255–259.

Paper received 09.05.2012; accepted for publication 27.09.2012

Correspondence:

Prof. Taha Fouda
Department of Clinical Studies,
College of Veterinary Medicine &
Animal Resources,
King Faisal University, KSA
e-mail: foudataha@yahoo.com