

Effect of Spirulina Supplementation on Haematological Biomarkers of Lamb Productivity

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Spirulina (*Arthrospira platensis*) is a protein-rich and highly nutritious cyanobacterium which is a recognised livestock feed supplement (Holman & Malau-Aduli 2013). Protein supplementation to lambs generally results in a positive shift in productivity, liveweight and growth. These effects can be objectively assessed using specific haematological biomarkers (Braun *et al* 2010). The emergence of Spirulina supplementation has made it necessary to investigate its effects on haematological biomarkers of productivity.

Twenty-four, 6 month old lambs were randomly assigned Spirulina levels (CONTROL, LOW, HIGH) within a 9-week supplementation trial. All lambs were run together and supplemented Spirulina daily as a 1:10 g/mL suspension via oral drenching. Blood was sampled at the completion of the supplementation trial, using jugular venipuncture, and plasma was separated and commercially analysed for haematological metabolite concentrations (DPIPWE, TAS). Returned data was fitted into a Factorial ANOVA model in 'Statistical Analysis System, Version 9.1' software for interpretation, with found also means compared with normal ranges (Table 1).

Table 1. Spirulina supplementation level effect on lamb productivity haematological biomarkers' least square means (LSM) and standard error (SE)¹

Biomarker ²	Units	Spirulina Level						Normal Range
		CONTROL		LOW		HIGH		
		LSM	SE	LSM	SE	LSM	SE	
CK	UI	297.00	31.54	249.00	15.08	310.88	22.43	130 – 350
AST	UI	117.94	5.26	130.06	9.28	129.40	10.91	0 – 220
GLDH	UI	15.56	3.50	25.81	7.48	23.27	5.91	0 – 41
GGT	UI	79.40 ^a	2.43	70.81 ^b	2.98	69.25 ^b	3.04	31 – 72
Total Bilirubin	µmol/L	3.11	0.20	3.28	0.18	3.06	0.14	0 – 13
BHB	mmol/L	0.37	0.02	0.43	0.02	0.43	0.03	0.0 – 0.8
Creatinine	µmol/L	57.19 ^b	1.61	61.75 ^a	1.72	58.81 ^b	1.43	69 – 168
Urea	mmol/L	7.72	0.31	7.99	0.40	7.79	0.32	2.8 – 7.2
Total Protein	g/L	64.46	1.16	66.08	1.24	64.12	0.85	60 – 82
Albumin	g/L	35.53	0.57	36.30	0.53	35.73	0.50	24 – 30
Globulin	g/L	27.50	1.38	29.75	1.05	29.00	1.21	35 – 57
A/G Ratio	.	1.25	0.05	1.24	0.04	1.28	0.05	0.6 – 1.3
Glucose	mmol/L	3.81 ^b	0.09	4.04 ^{ab}	0.12	4.19 ^a	0.16	2.77 – 4.44

¹Row least square means bearing different superscripts significantly differ ($P < 0.05$). ²Creatine kinase (CK), aspartate aminotransferase (AST), glutamate dehydrogenase (GLDH), gamma-glutamyl transferase (GGT), beta-hydroxybutyrate (BHB), albumin/globulin ratio (AG Ratio)

GGT indicates liver health and was observed as highest in CONTROL lambs, possibly resulting as Spirulina supplementation has been previously associated with improved animal liver health (Holman 2013). Creatinine indicates muscle mass and was highest in MEDIUM Spirulina supplemented lambs suggesting these lambs to be larger than their experimental counterparts. This proves true, Holman *et al* 2012 corroborating MEDIUM Spirulina supplemented lambs to have highest liveweights. Heightened glucose concentrations found with HIGH Spirulina supplementation is thought to stem from its effects on dietary energy intake and consequential flow on effects. Spirulina supplementation does affect lamb productivity haematological biomarkers, albeit limited as several key productivity biomarkers failed to respond to Spirulina supplementation.

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