

Organically bound or inorganic Se in sheep nutrition



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Introduction

The biological functions of Se in animal nutrition are well documented and researched with many beneficial effects known. Inorganic Se supplementation is the norm to prevent Se deficiency in ruminant animals but evidence is now emerging that the organic form has additional benefits. However, relatively little is known regarding the organic form of Se supplementation in small ruminants. Van Ryssen *et al.* (1989) observed the most significant tissue effects of high-Se wheat (organic Se) vs. inorganic Se fed to sheep to be in the liver, muscle and wool. According to Mahan (1999), inorganic Se has a lower bioavailability in the rumen than organically bound Se and that some of the consumed Se is utilized by the microorganisms for their metabolism. Weiss (2003) also reported a higher bioavailability of organically bound Se.

Objectives

1. To compare two organic forms of Se supplements with inorganic Se fed to sheep.
2. To compare Se levels and the anti-oxidant status of sheep fed diets containing organically bound Se, inorganic Se or low levels of Se.

Table 1: Diet composition indicating Se levels of the four treatments (mg/kg)

Feedstuff	Inclusion, g/kg As Is	Feedstuff Se mg/kg	Dietary Se inclusion mg/kg
Wheat straw	760	0.11	0.08
Maize starch	150	0.01	0.00
Molasses meal	50	0.06	0.003
Urea	10	0.00	0.00
PREMIX CONTROL	30	0.00	0.01
TOTAL or	1000		0.09
PREMIX SoSel	30	6.08	0.18
TOTAL or	1000		0.26
PREMIX Se B	30	5.76	0.17
TOTAL or	1000		0.25
PREMIX Se A	30	6.03	0.18
TOTAL	1000		0.26

Materials and Methods

- Ethical clearance was obtained from the SU ethical committee (2007B03006).
- The trial was planned in two phases:
 - 1- Se depletion phase until animals reached blood Se levels < 100 ng/ml
 - 2- Se supplementation phase: Roughage based diet supplemented with a premix containing the different Se treatments (Table 1).
- Four groups with 10 Döhne-Merino wethers (40.4 ±0.9kg) per group were randomly allocated to treatment diets for a 90 d feeding period:
 - Control (<0.1 mg Se/kg)
 - Sodium selenite supplementation (SoSel) (0.3 mg/kg)
 - “Organic” Se 1 (Se B) (0.3 mg/kg)
 - “Organic” Se 2 (Se A) (0.3 mg/kg)
- Blood, liver, kidney and *Longissimus dorsi* samples were collected after the 90 day feeding period and analyzed for Se concentration and glutathione peroxidase activity (Glutathione peroxidase activity kit, Assay designs, Stressgen).
- Wool samples were analyzed for Se concentration.
- Data were analyzed for significance (P<0.05) using the one way ANOVA procedure of Statistica, 2008.

Results

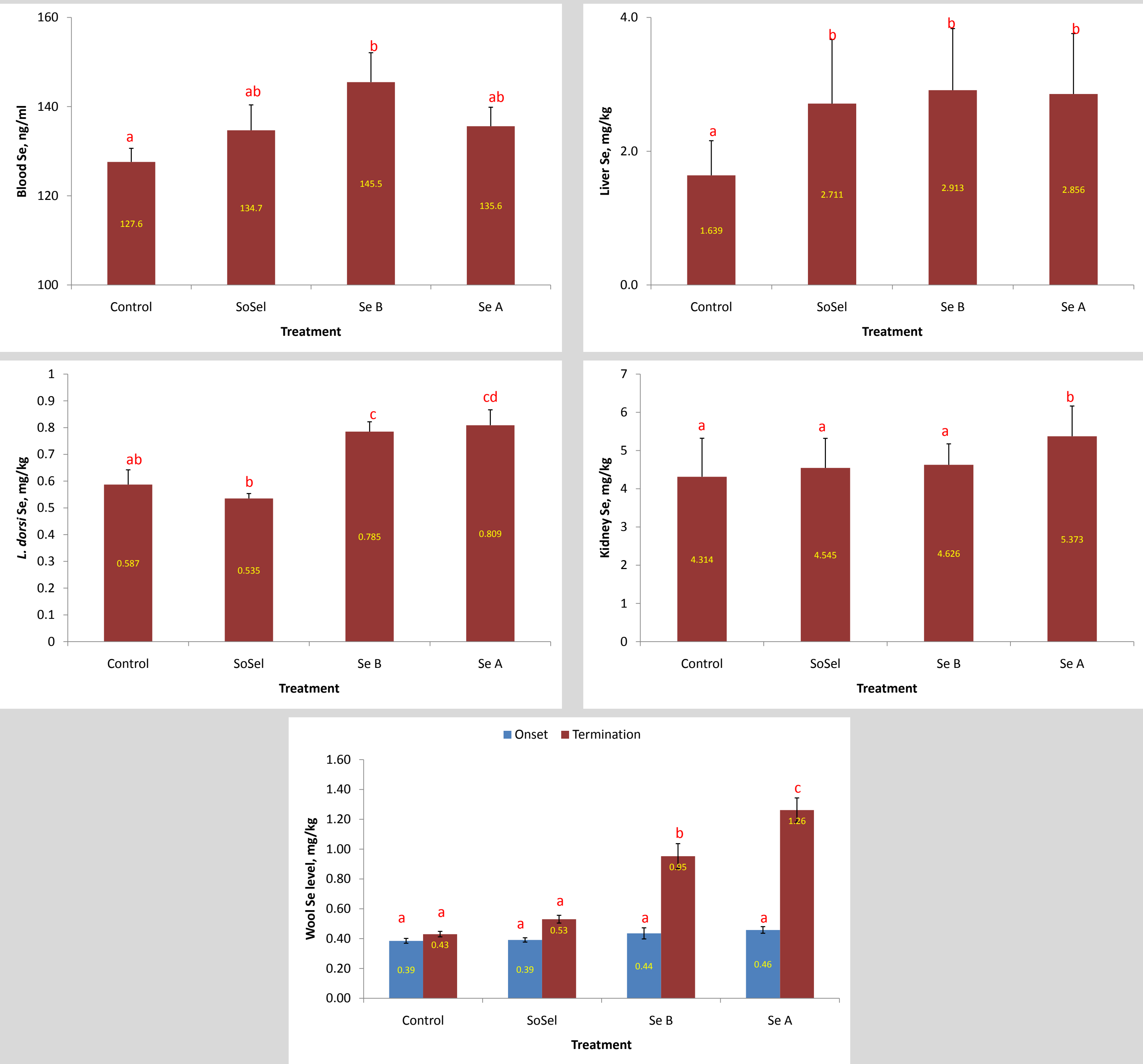


Figure 1. Se concentration of blood, liver, *L.dorsi*, kidney and wool samples collected from sheep after a 90d feeding period. Error bars indicate SEM.

Table 2: Glutathione peroxidase activity of blood serum, liver, *L. dorsi* and kidney samples collected from sheep fed the respective diets for 90 days

GPx activity, u/ml *	Control ± SEM	SoSel ± SEM	Se B ± SEM	Se A ± SEM
Serum	13.5 ± 5.6	13.7 ± 3.9	13.7 ± 3.5	16.3 ± 3.9
Liver	13.2 ± 8.0	14.3 ± 2.9	14.6 ± 3.1	15.3 ± 4.0
<i>L.dorsi</i>	3.4 ± 1.1	4.8 ± 3.6	4.1 ± 1.6	5.1 ± 1.1
Kidney	12.6 ± 4.8	11.2 ± 7.3	9.9 ± 2.9	12.8 ± 4.4

No significant differences were observed

*One unit is defined as the amount of enzyme required to oxidize of 1nmole NADPH to NADP⁺ per minute at 25°C

Discussion

- Selenium supplementation, regardless of the form in which it was supplemented, resulted in increased Se levels of liver tissue (P<0.05).
- The organic form of Se resulted in higher Se levels in whole blood (Se B), muscle (Se B and Se A) and in the kidney (Se A) than the inorganic form (P<0.05).
- Only the organic form of Se resulted in higher Se levels in wool (P<0.05) with Se A being superior to Se B. This is ascribed to the incorporation of seleno-methione components into wool.
- No significant differences in glutathione peroxidase activity could be detected between any of the tissues analyzed.
- Contrast estimates (Statistica, 2008), however, indicated higher GPx activity in serum for the organic form compared to inorganic Se supplementation.
- It was concluded that the organic form of Se supplementation to sheep has additional benefits over and above those of inorganic Se supplementation.**

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