

# THE INFLUENCE OF SOURCE AND LEVEL OF SELENIUM IN CHICKEN FEED ON BREAST MEAT QUALITY

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## Introduction

Over the past few years, consumer demands regarding aspects of meat quality have substantially increased. Therefore, a challenge to the meat industry is to enhance the image of meat purchased at the supermarket. There are many meat quality characteristics that attract consumer attention (appearance, colour, texture, tenderness, juiciness, aroma) (Janssens, 1998). Consumers prefer fresh meat with minimum loss of water during handling and cooking. Therefore the water-holding capacity of the meat (Mahan and Kim, 1999) and colour are considered among the most important meat quality characteristics. It is well known that quality and especially chemical composition of produced meat are highly affected by feed composition. In order to evaluate chicken meat quality, as well as its quantity, different additives (vitamin E and C,  $\alpha$ -tocopherol, Se, ...) have been introduced to standard chicken feed, and regarding the published data, positive effects have been achieved (Sheehy *et al.*, 1997; Ahn *et al.*, 1998; Edens, 1996; 1997). The aim of this work was to investigate the influence of different sources and levels of selenium in chicken feed on technological quality characteristics (pH, drip loss and colour) of breast meat.

## Materials and Methods

Cobb 500 hybrids, both sex, were used for the investigations. The trial was designed as 4 x 8 test (4 groups and 8 replicates). This includes 32 pens with 78 broilers in each pen. Stocking density was 15 birds/m<sup>2</sup>. Air temperature was adjusted in accordance to the technological demands. Feed and water supply were *ad libitum*. Feed composition was the same for all four groups, based on corn, soya and sunflower, except added premixes. Experimental treatments were the following: (A) Feed containing 0.3ppm Se from sodium selenite (NaSe); (B) Feed containing 0.2ppm Se from NaSe and 0.1ppm Se from Sel-Plex; (C) Feed containing 0.1ppm Se from NaSe and 0.2ppm Se from Sel-Plex; (D) Feed containing 0.3ppm Se from Sel-Plex.

After 42 days of fattening, two groups of broilers containing 24 birds each, of similarly same final mass were slaughtered, processed and chilled by standard technological procedure. Breast meat was taken from each bird for the determination of pH value, colour and drip loss. pH<sub>a</sub> was determined 24 h *post mortem* (pm) on the cranial part of breast using the portable pH-meter ULTRA X. Drip loss (DL) was measured on breast meat. Breast meat was separated from the bone and both parts were separately hung the hook and covered with plastic bag (Honikel, 1998). All the samples were put into a refrigerator at 4°C. After 24 hours, the first measurement was carried out (on one half of the breast meat), and after 48 hours the second measurement was done on the other part of the meat of the same bird. Colour of breast meat was determined on fresh cut 24h and 48h *post mortem*, after chilling, using the Minolta Chroma Meter CR-400, and the colour characteristics were expressed in CIELa\*b\* system (Robertson, 1977).

## Results and Discussion

The results of technological breast muscle characteristics determination are presented in Table 1. The highest average pH<sub>a</sub> value – 5.89, was determined in breasts of birds of experimental group A, and the lowest average value – 5.81, was in breast muscles of experimental group C. The differences between the average pH<sub>a</sub> values of muscles of experimental groups are not statistically significant ( $P > 0.05$ ), and the mean values respond to values of normal quality of meat. Statistically significantly lower ( $P < 0.01$ ) mean value of DL was determined in breast meat of experimental group D (0.60%) compared to DL of breast meat of experimental groups A and B (0.91%), measured 24 h pm. The lowest DL value was measured 48h (0.84%) in breast meat of experimental group D, and it was significantly smaller ( $P < 0.05$  or  $P < 0.01$ ) compared with DL of breast meat of experimental groups A and B (1.13%, 1.25%, respectively). The results of DL determination show that average values of breast meat DL, measured 24 h pm, are statistically significantly lower ( $P < 0.05$  or  $P < 0.01$ ) or have a tendency of statistical significance, than the DL values measured 48 h pm. The obtained results are in accordance with the results of Edens (2001), Naylor *et al.* (2000) and Mahan *et al.* (1999), who found that organic Se (0.3ppm), introduced to chicken feed, affects decrease of DL, and that meat quality can be preserved during storage replacing the inorganic Se with organic Se in feed. The lightness (L\*) of breast cut was determined instrumentally (Table 2) 24h pm. Breast muscles of experimental group D were the darkest, but not statistically significantly ( $P > 0.05$ ).

**Table 1:** Influence of source and level of Se on drip loss and pH value of breast meat.

Traits	Groups	24 h pm	48 h pm	24-48 h pm
		Mean ± SD	Mean ± SD	Paired t-test
pH <sub>u</sub>	A	5.89±0.17		
	B	5.86±0.19		
	C	5.81±0.15		
	D	5.87±0.18		
DL (%)	A	0.91 <sup>A</sup> ±0.32	1.13 <sup>aAB</sup> ±0.23	0.049
	B	0.91 <sup>A</sup> ±0.27	1.25 <sup>aA</sup> ±0.27	0.003
	C	0.79 <sup>AB</sup> ±0.27	1.05 <sup>abAB</sup> ±0.28	0.070
	D	0.60 <sup>B</sup> ±0.21	0.84 <sup>bB</sup> ±0.32	0.047

The average lightness values (L\*) are in the range from 50.95 (D) to 51.43 (B) and respond to values of normal meat quality (48 < L\* < 53). The lightness (L\*) of breast muscle of all investigated groups determined 48 h pm is statistically significantly (P < 0.05 or P < 0.01) higher compared with lightness of breast muscles determined 24 h pm; however, the difference between average lightness values (L\*) measured after 48 h pm was not statistically significant (P > 0.05).

**Table 2:** Influence of source and Se level on breast meat colour 24 and 48 h post mortem.

Traits	Groups	24 h pm	48 h pm	24-48 h pm
		Mean ± SD	Mean ± SD	Paired t-test
CIEL* (lightness)	A	51.23±3.46	53.67±2.88	<0.001
	B	51.43±3.23	53.65±2.85	0.036
	C	51.31±3.83	53.83±3.01	<0.001
	D	50.95±5.39	53.00±4.80	0.007
CIEa* (redness)	A	3.29±1.51	3.88 <sup>ab</sup> ±1.45	<0.001
	B	3.13±1.13	3.03 <sup>b</sup> ±1.04	0.712
	C	3.36±0.92	3.34 <sup>ab</sup> ±1.02	0.898
	D	3.72±0.91	4.20 <sup>a</sup> ±0.75	0.008
CIEb* (yellowness)	A	6.20±1.68	7.27±1.90	<0.001
	B	7.29±1.62	7.89±1.92	0.231
	C	6.70±1.12	7.51±1.03	0.004
	D	6.53±1.78	7.90±2.21	0.001

The portion of red colour (a\*) in breast meat of experimental group D, determined 48 h pm is significantly higher (4.20) compared to breast meat of experimental group B (3.03). The portion of yellow colour (b\*) determined 48 h pm (7.90) is significantly higher (P < 0.01) in breast meat of experimental group D compared to breast meat of the same group, but determined 24 h pm (6.53).

ab - P<0.05; AB - P<0.01

### Conclusions

The addition of organic Se to chicken feed (containing 0.3 ppm Se from Sel-Plex) significantly affected the decrease in drip loss of breast meat. The colour (lightness - L\*) is the darkest, and the portion of red colour (a\*) the highest in the same group (group D) of investigated breast muscles, but the stated differences are not statistically significant.

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