The effect of chemical preservative supplementation on the nutritive value of lupine silage.

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Introduction Lupine (*Lupinus,* L.) is presently an important non-traditional leguminous crop whose economic meaning is gaining importance worldwide. Typical for lupine as roughage is a low DM content, low concentration of water-soluble carbohydrates (WSC), and therefore, it must be wilted before the ensiling (Jones et al., 1999). Despite a higher content of nitrogen substances, the buffering capacity of the whole ensiled lupine plant is similar as that of some grass varieties, but significantly lower in comparison with other legumes. The aim of this experiment was to evaluate the effect of chemical additive on the nutritive value of lupine silage when ensiling lupine under exactly defined model conditions.

Material and methods In the model experiment, yellow lupine (*Lupinus luteus*) variety Juno was ensiled. The whole lupine plants with a dry matter content of 187.15 g/kg were harvest, wilted and subsequently chopped during collection to a particle length greater than 35–50 mm. This model experiment used fresh crop lupine with 240.4 g/kg DM. One control (A) without preservative and two experimental variants (B and C) with preservative (acids mixture) were used. The chemical preservative composed of formic acid, propionic acid, benzoic acid, and ammonium formiate. The preservative was applied at a dose of 3 L/t (B) and 6 L/t (C). This material was ensiled in three replications in special experimental containers with content (volume) of 4 L, was hermetically sealed, and stored at a temperature of 22–25 °C for three months. The analytical procedures were described earlier AOAC, (1980). The pH value was determined electrometrically, and NH_3 by the microdiffusion method according to Conway. Rumen degradability of silages protein was determined by *in sacco* method (Kacerovský et al., 2007). Results were statistically analysed using the method one factorial analysis of variance analysis.

Results and Discussion The chemical composition and nutritive value of the whole ensiled lupine plant differed from other leguminous crops. One kilogram of the original biomass dry weight contained 8.2 g of crude protein, 221.7 g of crude fibre, 290.4 g ADF, 410.9 g NDF, and 140.5 g of starch. Rumen degradability of crude protein was 60.18 %. The content of water-soluble carbohydrates was 31.5 g of 1 kg DM. Dry weight of the whole lupine plant was low and after one-day wilting its value increased only to 18.72 %, which is within the range recommended by Jones et al. (1999). The nutritive value of the control and treated model lupine silages from wilted forage are shown in Table 1.

Conclusion The best nutritive value was found in model silages with the supplement of acid mixtures dosed at 6 L/t since they showed not only a better content of net energy (NEL) and CP but also a significantly ($P<0.01$) lower NH_3, pH value, a more favourable RDP content than the control silage. The positive effect on RDP and starch content was higher in silages treated with the preservative in level of 6L/t as in untreated silage.

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Table 1 Effect of chemical preservative on nutritive value and digestibility of crude protein of lupine silage

Silage Variant	**A**	**B**	**C**
Specification	**Average± s.e.**	**Average± s.e.**	**Average± s.e**
DM (g/kg)	187.99±0.68 ^{A}	182.15±2.89 ^{B}	188.40±3.04 ^{A}
pH	4.07±0.01 ^{C}	3.81±0.02 ^{A}	3.90±0.02 ^{B}
NH_3 (mg/kg)	696.18±4.99 ^{C}	556.95±11.11 ^{B}	475.87±10.76 ^{A}
CP (g/kg DM)	202.7	217.3	205.3
RDP (g/kg DM)	699.1	668.2	635.2
Fat (g/kg DM)	20.3	22.0	2.15
CF (g/kg DM)	245.5	269.6	268.0
DF (g/kg DM)	312.8	337.9	339.3
NDF (g/kg DM)	471.7	524.5	523.2
Ash (g/kg DM)	104.1	101.0	92.2
Starch (g/kg DM)	95.7	111.2	127.9
ME (MJ/kg DM	9.44	9.40	9.59
NEL (MJ/kg DM)	5.56	5.51	5.59
PDIN (g/kg DM)	107.98	109.56	108.25
PDIE (g/kg DM)	76.32	76.71	76.44
WSC (g/kg DM)	2.1	9.5	11.9

DM – dry matter; RDP – rumen degradability of protein; CF – crude fibre; ADF – acidodetergent fibre; NDF – neutral detergent fibre;