# Effect of variety and species on the chemical composition of *Lotus* when ensiled

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**Introduction** Research has shown that there are positive benefits from using *Lotus* as a grazing forage for ruminants. These findings warrant studies into the suitability of different varieties for silage production. In this experiment, we investigated the chemical composition of 13 birdsfoot trefoil varieties and 1 greater birdsfoot trefoil when ensiled.

**Materials and methods** Replicate 2.4 x 6 m plots of pure stands of 13 varieties of *L. corniculatus* or 1 variety of *L. uliginosus* (previously *L. pedunculatus*) were sown at 12 kg/ha in a randomised block design. Plots were maintained by cutting to a height of 100 mm using a Haldrup 1500 plot harvester, on 2 and 3 occasions in the establishment and first harvest year, respectively. At cut 2 of the first harvest year, sub-samples of forage were taken and separated according to *Lotus* and unsown species. Approximately 3 kg of the *Lotus* only sample was then wilted *in situ* for 24 h, chopped (to approximately 20 mm) using a stationary modified precision chop forage harvester, before being treated with a *Lactobacillus plantarum* inoculant (Live System, Genus Ltd., UK), applied at $10^6$ colony forming units per gram fresh matter. One kg of this forage was weighed, compacted and ensiled in laboratory scale silos (four replicates of each *Lotus*) of PVC drain-pipe 100 mm diameter and 450 mm long and sealed as described by Jones (1988). The silos were opened after 110 days and the contents of each tube weighed and thoroughly mixed before representative sub-samples were collected and analysed for chemical composition.

**Results** The results show differences in crude protein (CP), water-soluble carbohydrate (WSC), ammonia-N and lactate concentrations exist among varieties and species of *Lotus* (Table 1). Overall, the silages were well preserved, with pH and ammonia-N within acceptable ranges. All silages had lower than expected ammonia-N and lactate concentrations, indicating reduced proteolysis in *Lotus* silages compared to other forages.

**Table 1** Effect of *lotus* species or variety on silage chemical composition (all values g/kg DM, except DM content (g/kg FM) and Ammonia-N ($NH_3$-N) (g/kg TN)) at second cut of the first harvest year

| Cultivar | Country of origin | DM | CP | WSC | NDF | pH | $NH_3$-N | Lactate |
|---|---|---|---|---|---|---|---|---|
| Oberhaunstaedter | Germany | 327 | $192^{ef}$ | $15^{d}$ | 416 | 4.43 | $27^{bc}$ | $18^{ab}$ |
| Lotar | Czech Rep. | 316 | $200^{def}$ | $17^{cd}$ | 423 | 4.28 | $28^{bc}$ | $19^{a}$ |
| Emlyn | Hungary | 315 | $187^{f}$ | $17^{cd}$ | 432 | 4.36 | $36^{b}$ | $18^{ab}$ |
| Leo | Canada | 306 | $219^{ab}$ | $19^{bcd}$ | 413 | 4.30 | $27^{bc}$ | $18^{ab}$ |
| Upstart | Canada | 314 | $226^{a}$ | $18^{bcd}$ | 400 | 4.36 | $27^{bc}$ | $19^{a}$ |
| Steadfast | USA | 308 | $217^{abc}$ | $21^{abc}$ | 397 | 4.37 | $33^{b}$ | $12^{d}$ |
| Georgia-1 | USA | 336 | $190^{ef}$ | $20^{abcd}$ | 397 | 4.37 | $20^{c}$ | $12^{d}$ |
| Dawn | USA | 304 | $216^{abc}$ | $23^{ab}$ | 412 | 4.34 | $34^{b}$ | $14^{bcd}$ |
| Norcen | USA | 310 | $211^{bcd}$ | $25^{a}$ | 440 | 4.27 | $27^{bc}$ | $16^{abcd}$ |
| AU-Dewey | USA | 336 | $203^{cde}$ | $18^{bcd}$ | 406 | 4.39 | $29^{bc}$ | $13^{cd}$ |
| Inia Draco | Uruguay | nd | nd | nd | nd | nd | nd | nd |
| San Gabriel | Uruguay | nd | nd | nd | nd | nd | nd | nd |
| Grasslands Goldie | New Zealand | 342 | $204^{cde}$ | $18^{bcd}$ | 398 | 4.27 | $26^{bc}$ | $19^{a}$ |
| Grasslands Maku† | New Zealand | 316 | $225^{ab}$ | $7^{e}$ | 450 | 4.49 | $49^{a}$ | $17^{abc}$ |
| SED | | 16.9 | 7.1 | 2.4 | 18.6 | 0.070 | 5.2 | 2.1 |
| C | | NS | *** | *** | NS | NS | ** | ** |

†*L. uliginosus*; C, effect of species/cultivar; nd, not done due to insufficient sample available; NS, not significant; **, $P<0.01$; ***, $P<0.001$. Means in the same column with different superscripts are significantly different.

**Conclusions** Differences in chemical composition exist among *L. corniculatus* varieties when ensiled. Further studies are now needed to investigate protein degradation in *Lotus* species during the ensiling process.

**References**

Jones, D.I.H. (1988). The effect of cereal incorporation on the fermentation of spring and autumn silages in laboratory silos. *Grass and Forage Science*, 43, 167-172.