

Effects of willow (*Salix*) versus poplar (*Populus*) supplementation on the reproductive performance of ewes grazing low quality drought pasture during mating

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Abstract

An 87 days grazing experiment, in the late summer/autumn of 2002 in Masterton (New Zealand), compared the effects of willow (*Salix*) versus poplar (*Populus*) supplementation (1.3 kg fresh/ewe/day), during mating, on reproductive performance and wool production in ewes grazing low quality drought pasture. A rotational grazing system with 285 mixed age Romney ewes (55.2 ± 0.54 kg) was used, with 95 ewes per treatment (control, willow-supplemented and poplar-supplemented). All ewes were offered about 0.70 kg dry matter (DM)/day of low quality pasture, containing 62% dead matter, with pre- and post-grazing pasture masses of 941 and 456 kg DM/ha.

Abbreviations: ADF, acid detergent fibre; BCS, body condition score; CHO, carbohydrate; CP, crude protein; CT, condensed tannin; *D*, diameter (mm); DM, dry matter; DOMD, digestible organic matter (g)/100 g DM; ELISA, enzyme linked immunosorbent assay; FA, feed allowance (DM/ewe/day); GLM, generalised linear model; HCL, hydrochloric acid; HM, herbage mass (kg DM/ha); LIG, lignin; MAF, Ministry of Agriculture and Forestry; ME, metabolisable energy; ND, not determined; NDF, neutral detergent fibre; \$NZ, New Zealand dollar; OM, organic matter; OMD, organic matter digestibility; *P*, probability; PA, paddock/break area; PG, phenolic glycoside; RDN, rumen degradable nitrogen; SAS, Statistical Analysis System; SE, standard error; *t*, experimental period (days); TGD, total grazing days; UDP, undegradable dietary protein; WSC, water-soluble carbohydrate

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Pasture consumed was typical of drought pasture; 571 g neutral detergent fibre (NDF)/kg DM, 0.540 organic matter digestibility (OMD). Both the willow and poplar diets selected were higher in OMD and metabolisable energy (ME) and had a higher ratio of readily fermentable carbohydrate (CHO) to structural CHO, than the pasture diet selected. Willow contained higher concentrations of condensed tannin (CT; 52 g/kg versus 19 g/kg; $P < 0.001$) and total phenolic glycosides (34 g/kg versus 17 g/kg; $P < 0.001$) than poplar. The concentration of total phenolic glycosides increased curvilinearly over time with peak values between 51 and 61 days, corresponding to the mating period. Reproductive rate was low in the control ewes (133 lambs born/100 ewes mated), with willow supplementation reducing live weight (LW) loss (-86 g/day versus -103 g/day) and increasing ewe reproductive rate by 15, 17, 21 and 20% units at ultrasound scanning, lambing, docking and weaning, respectively, through an increase in the proportion of multiple pregnancies (fecundity). Poplar supplementation had no effect on reproductive rate, probably due to contamination with poplar leaf rust (*Melampsora larici-populina*), which may produce an unknown oestrogenic substance. There were no treatment effects on wool production and only small treatment effects on the LW of single- and twin-born lambs at birth and weaning. Willow tree trimmings are a beneficial supplement for increasing the reproductive rate of ewes grazing drought pasture during the pre-mating and mating periods and they may be superior to poplar tree trimmings, due to higher concentrations of both CT and phenolic glycosides. Willow supplementation increased the intakes of DM and ME, but this did not explain all of the increase in reproductive rate. The increased concentration of total N, CT, phenolic glycosides and water-soluble CHO in the diet of supplemented ewes would be likely to increase amino acid absorption and this may explain the remainder of the increase in ewe reproductive rate from willow supplementation.

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1. Introduction

In New Zealand, the East Coast regions of Gisborne, Hawke's Bay, Wairarapa, Marlborough, Canterbury and North Otago experience intensely hot, dry conditions during the summer and early autumn, with severe droughts occurring every 7–10 years. The loss in livestock productivity on pastoral farms, due to drought, lead to large losses in farm revenue. Ward (1999) estimated that the farm gate cost of the 1997 and 1998 droughts totalled \$NZ 800 million.

Drought in the summer/autumn severely affects sheep production systems due to low pasture growth and quality, thus limiting the feed available for grazing ewes during the pre-mating and mating periods. Feeding ewes at a level below maintenance results in loss of live weight (LW) and body condition score (BCS) and, during mating, severely reduces ovulation rate and subsequent lambing percentage (Ratray et al., 1980, 1981, 1983; Smith and Knight, 1998).

A recent study has shown that poplar tree trimmings are a beneficial supplement to sheep grazing drought pastures during the pre-mating and mating periods (McWilliam et al., 2004). The authors found that feeding poplar trimmings to ewes at the rate of 1.50 kg/ewe/day for 71 days, including mating, increased reproductive rate by approximately 30% and significantly

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