

# N-P-S FERTILIZER EFFECTS ON BRUTE PROTEIN CONTENT IN A NATIVE MEADOW IN TIERRA DEL FUEGO

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## ABSTRACT

Fertilization may have a positive effect in improving forage quantity and quality in natural meadows of Tierra del Fuego. The objective of the present study was to estimate N-P-S fertilizer effects on forage quality. The trial was set up in 1994 on an Entic Haploborol soil characterized by low P availability (12 ppm, Truog), high N content (1.5% total N) and medium acidity (pH 5.9). A Complete Randomized Split Plot Design was used and N-P<sub>2</sub>O<sub>5</sub>-S nutrients were applied at a rate of 120-100-50 kg.ha<sup>-1</sup>. Monthly mowing began in January and finished in April 1995. CP and IVDMD were determined. CP content was significantly higher for any of the N-treatments, but no P or S effects were found. Within harvest dates, January and February differed from March and April. No interactions were found between fertilizer treatments and harvest dates.

## KEYWORDS

Native meadow, NPS fertilization, protein content, south Patagonia

## INTRODUCTION

The most limiting factor for animal production enhancement in Tierra del Fuego (Argentina) is forage shortage, either production and quality, during winter. For that reason, one of the practices being developed at present is natural meadow forage conservation. Although primary production is high during summer, this technique is poorly developed, and neither harvest date nor forage quality is well known in the region. Little research has been done about fertilization effects on meadows (Catalano, 1986; Mendoza *et al.*, 1993; Posse *et al.*, 1995), and they suggested a positive impact of this technique in improving forage production but no quality parameters were measure. The objective of this study was to estimate the effects of N-P-S fertilization on forage quality in a natural meadow.

## MATERIALS AND METHODS

The experimental area was located in central-east Tierra del Fuego. Climate in the region is cold with strong winds from the west. Mean temperature in winter (July) is about 0½C and in summer (January) 10½C. Annual rainfall ranges from 250 to 350 mm.

The trial was set up in 1994 on an Entic Haploborol soil (FAO Classification). It was characterized by low P availability (12 ppm, Truog), medium acidity (pH 5.9) and high total-N content (1.5%). Vegetation was characterized by grasses: Kentucky bluegrass (*Poa pratensis*), *Poa poecilla* and timothy (*Phleum pratensis*); sedges (*Carex macloviana*, *Carex vallis-pulchrae*); *Juncus balticus*; and dicots: common dandelion (*Taraxacum officinale*), *Perezia sp* and *Caltha sagitata*. Inoculated white clover (*Trifolium repens*) was hand interseeded in December at a density of 2.5 kg/ha, but did not emerge during the first year.

A Complete Rrandom Split Plot Desin (n=4) was used, with 10 m<sup>2</sup> plots, and the following treatments: Control (C) without fertilization, Control+white clover (CWC), nitrogen (N), nitrogen+phosphorus (NP), nitrogen+sulphur (NS), nitrogen+phosphorus+sulphur (NPS), phosphorus+sulphur (PS) and phosphorus+sulphur+white clover (PSWC). Nutrient rates were: 120 kg N.ha<sup>-1</sup> (as urea), 100 kg P<sub>2</sub>O<sub>5</sub>.ha<sup>-1</sup> (as triple superphosphate) and 50 kg S.ha<sup>-1</sup> (as bio-sulphur). P- and

S- fertilizers were applied early in the growing season (December) with half of the N-fertilizer application. The rest of the N-fertilizer was applied in February.

Each plot was divided in four sub-plots and randomized for monthly mowing from January to April. Forage was clipped, weighed and then oven-dried (60½C). Forage samples were ground to pass a 1 mm screen (Wiley Lab. Mills, standard Model 4). Dry matter nitrogen was obtained using Kjeldahl method and multiplied by 6.25 to obtain crude protein (CP). IVDMD was determined using Goering and Van Soest detergent method.

CP data were analyzed using ANOVA and means were compared using Tukey's test (p<0.05) (1988. SAS/STAT User's Guide. Release 6.03. SAS Inst. Inc. Cary NC). Fertilization treatment was the main plot and harvest date the subplot. Fertilization x harvest date interaction was analyzed.

## RESULTS AND DISCUSSION

Crude protein content was significantly higher for any of the N-treatments, but no P- or S- effects were found (table 1). Within harvest dates, January and February were different from March and April (Table 1). No differences were found within each group (N-treatments vs treatments without N) and no interactions were found between fertilization treatments and harvest dates (Figure 1).

Reece *et al.* (1994) found that N-fertilizer increased CP concentration on initial harvest dates. Dumont and Lanuza (1993) and Kolar *et al* (1995) reported similar effects. They found the most significant difference in CP resulting from an increased N supply. On the contrary, no P-fertilizer effects were consistently found on CP content of forages (Buxton and Fales, 1994). Although an S-effect on forage quality has been reported (Paterson *et al.*, 1994) application of S-fertilizer had inconsistent results in many studies (Buxton and Fales, 1994).

IVDMD (data not shown) could have been influenced by S-fertilizer, especially when combined with N-fertilizer (NS treatment: 63.4% vs all other treatments mean: 59.2%, cv= 2.9%) but this effect was not determined. Although S- fertilization have been reported to improve animal performance (Paterson *et al.*, 1994), no reports were found indicating N- or S-effects on dry matter digestibility (Dumont and Lanuza, 1993; Paterson *et al.*, 1994; Reece *et al.*, 1994).

Fertilization of natural meadows that are N-deficient seems to be a good method for improving forage quality in Tierra del Fuego. More research about its effects on DM production is needed to determine the best harvest date for forage conservation, combining high quality and high DM yield.

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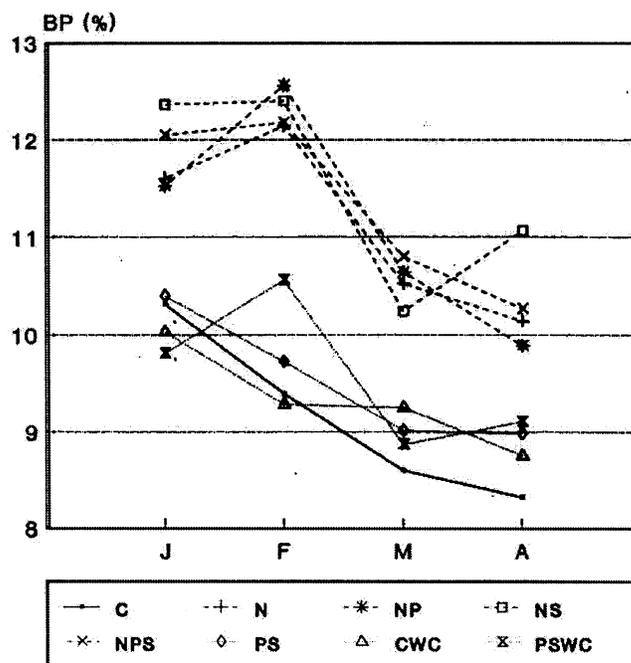
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**Figure 1**  
CP content (5) in a native meadow in Tierra del fuego with NPS fertilization (January - April 1995).



**Table 1**

Crude protein content (%) ANOVA (p<0.05) by main plots (fertilizer treatment) and subplots (harvest date).

Fertilizing treatments			Harvest dates	
NS	11.653	a	February	11.027 a
NPS	11.333	a	January	11.018 a
NP	11.162	a	March	9.813 b
N	11.112	a	April	9.563 b
PSWC	9.594	b		
PS	9.528	b		
CWC	9.329	b		
C	9.133	b		

a,b values on the same column followed by the same letter are not different, P<0.05.