

Feeding potential of summer grain crop residues for woolled sheep in the south-eastern Transvaal Highveld. II. Selection of material and intake

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Received 7 June 1990; revised 28 September 1990; accepted 15 March 1991

Döhne Merino wethers grazed crop residues of lupins, dry beans, soybeans, sunflower, sorghum and maize at a stocking rate of 10 wethers/ha. Three wethers in every treatment were oesophageally fistulated and during sampling periods the other seven were fitted with faecal bags. Oesophageal and faecal samples were taken during the same period every second week. Oesophageal samples were separated into grain and straw (including weeds) to determine the grain: straw ratio and were analysed for dry matter (DM), organic matter (OM), crude protein (CP) and *in vitro* digestible organic matter (IVDOM). Digestible organic matter and protein intake of sheep generally decreased with time as grain availability declined. At commencement of grazing the nutritional value of the residues was sufficient for sheep to increase mass. Crude-protein intake decreased with time and should be supplemented to sustain production.

Döhnemerinohamels het die oesreste van lupiene, droëbone, sojabone, sonneblom, sorghum en mielies teen 'n belading van 10 skape/ha bewei. Drie van die hamels in elke groep was slukdermgefristuleerd en gedurende monster-nemingsperiodes het die ander sewe hamels missakke gedra. Slukderm- en mismonsters is gedurende dieselfde periode elke tweede week geneem. Slukdermmonsters is in graan- en strooikomponente (insluitend onkruid) verdeel om die graan: strooiverhouding te bepaal en is vir droë materiaal (DM), organiese materiaal (OM), ruproteïen (RP) en *in vitro* organiese materiaal verteerbaarheid (IVOMV) ontleed. Verteerbare organiese materiaal- en proteïenname het oor tyd afgeneem soos die hoeveelheid graan beskikbaar afgeneem het. Met aanvang van beweiding was die voedingswaarde van die oesreste hoog genoeg vir massatoename by die skape. Proteïenname het oor tyd gedaal en moet aangevul word om produksie te onderhou.

Keywords: Sheep, crop residues, digestible organic matter intake, protein intake.

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Introduction

Sheep on crop residues can utilize the remaining grain on the land very effectively (Esterhuyse, Niemand & Meissner, 1991). This can benefit sheep production and limit self-sown seedlings in the next season. During the first few weeks of grazing, intake is sufficient to satisfy more than the maintenance requirements of the sheep (Esterhuyse *et al.*, 1991).

Schoonraad (1985) assessed the intake and selection of sheep on maize residues. Almost no literature is available on the selection and intake of sheep on other crop residues. In our first paper (Esterhuyse *et al.*, 1991) the availability of the residues of six grain crops for wintering sheep and the performance of dry sheep grazing these residues were considered. In this paper we give information on diet selection and digestible organic matter and protein intake.

Procedure

The experimental site and cultivation of the six crops have been described by Esterhuyse *et al.* (1991). One hectare of residues of each of lupins, dry beans, soybeans, sunflower, sorghum and maize were stocked with comparable groups of 10 Döhne Merino wethers each. To accustom the sheep to the specific grain, each group was fed appropriate amounts of the grain in pens for an eight-day period before being introduced to the crop residues. Three sheep in each group were oesophageally fistulated and the other seven were fitted with faecal bags during sampling periods.

Oesophageal and faecal samples were collected every second week. Oesophageal samples were collected on days one, three and five after a fasting period of 2 h and faecal samples were collected consecutively for five days. The method of Engels *et al.* (1981) was used to collect and

process the oesophageal samples. Samples were dried at 50°C, separated into the components grain and straw (including weeds) and weighed to determine the grain: straw ratio. Samples were taken for determination of dry matter (DM) (AOAC, 1984), organic matter (OM) (AOAC, 1984), *in vitro* digestible organic matter (IVDOM) (Tilley & Terry, 1963 as modified by Engels & Van der Merwe, 1967) and crude protein (CP) (AOAC, 1984) of the contents on an OM basis. Faecal samples were dried, weighed and samples were taken for the determination of DM and OM. Intake of digestible OM and CP was calculated using methods described by Engels (1983).

Results and Discussion

Oesophageal samples

Grain : straw ratio

The percentage grain in the diet, estimated from oesophageal samples, is shown in Figure 1. The straw fraction included weeds. Almost all sunflower and sorghum grain had been utilized by birds; none was found in the oesophageal samples for sunflower and, except on the first sampling occasion in Season 1 when 8% was recorded, no grain was found in the samples of sorghum.

Initially, grain was the preferred component in all other crop residues. The decreasing proportion in the oesophageal samples with time almost certainly reflected the decreasing availability of grain. Appreciably more grain was eaten in

the first as compared with the second season, as a result of a higher availability of grain, except with soybeans.

At the onset of the experiment the grain : straw ratios on the maize residues for Seasons 1 and 2 were 26:74 and 10:90 respectively. Van Pletzen (1983) recorded a ratio of 93:7 at the start of grazing and Schoonraad (1985) a ratio of 80:20 for the first collection on maize residues. Schoonraad (1985) did not pick up the cobs, so much more grain was available.

Crude protein content

Changes in percentage crude protein in oesophageal samples are shown in Figure 2.

With all crops, CP content of oesophageal samples was initially high but decreased with time. Generally, the decrease was rapid at first and slower later, though the patterns varied somewhat with the different crops. As expected, the initial CP content was higher with the legume crops, viz. lupins, dry beans and soybeans, than with the non-legumes. The lupin samples had the highest CP content as a result of the high grain ratio. Considering that no grain was available in the sunflower residues, the CP content of the diet of sheep grazing the residues of this crop was remarkably high. The values recorded initially for maize are of the same order as the 11,3% found by Schoonraad (1985) at corresponding times.

At the end of the grazing periods, CP content was 5—7% in all crop residues.

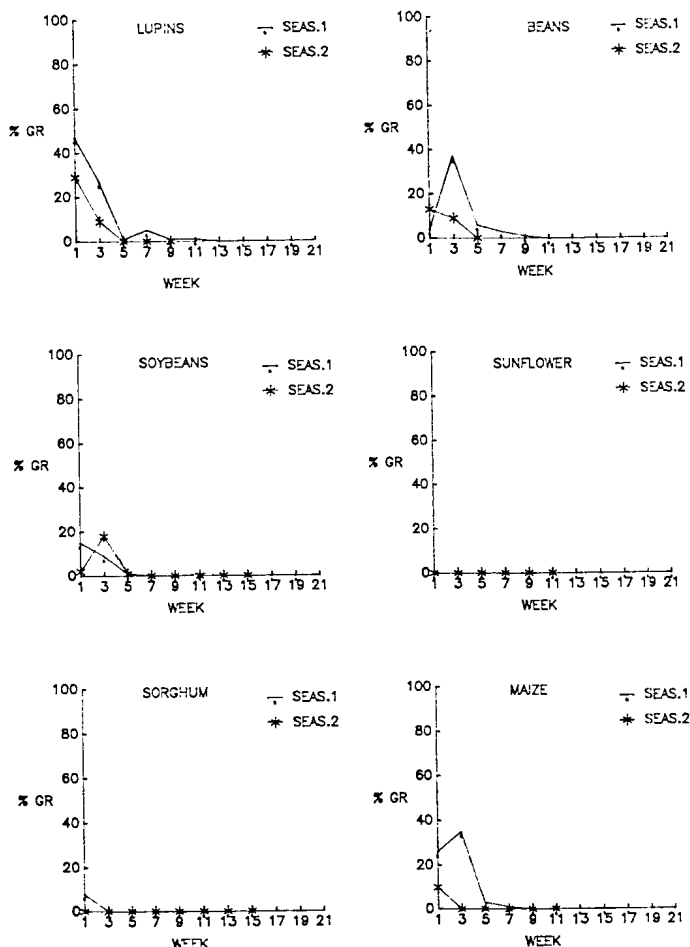


Figure 1 Percentage grain in the oesophageal samples.

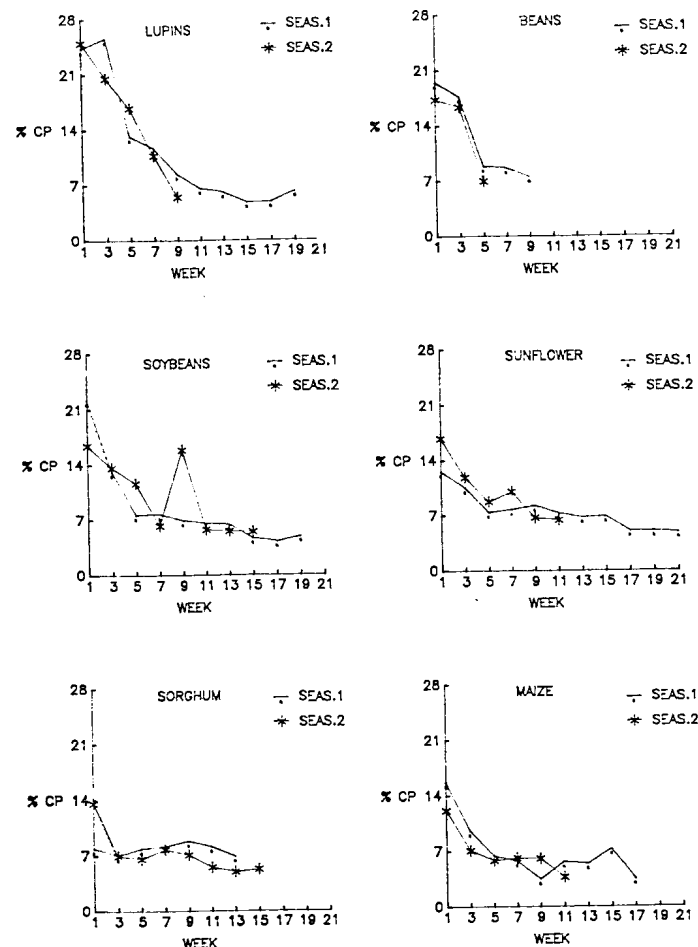


Figure 2 Percentage crude protein in oesophageal samples.

In vitro digestible organic matter

The change in percentage IVDOM with time of oesophageal samples is shown in Figure 3.

There was a tendency for the IVDOM percentage to decrease with time, but the patterns were inconsistent. In the case of sunflower, the IVDOM percentage of the samples was initially low but increased over the next few weeks. This can possibly be attributed to a delay in adaptation by the sheep to residues which consisted mainly of stalks. It seemed that there was a conformity between the grain proportion and the digestible OM percentage on the various crops and in the two seasons. Hence, the grain component had an important influence on digestibility during the early periods of grazing. However, weeds could also have been important and in the case of lupins, the high initial digestibility was probably due in part to the fact that the lupin residues had been grazed before frost killed the weeds (Esterhuysen *et al.*, 1991). Schoonraad (1985) recorded with commencement of grazing on maize residues a very high IVDOM of 83,8% in comparison with the 67,9% in this study, suggesting that in her study maize grain was selected almost exclusively.

The percentage IVDOM of dry beans differed very much over the two seasons as a result of the amount of material, and this suggests that seasonal differences may limit the value of this crop residue.

Intake of sheep

Digestible organic matter intake

The calculated DOM intakes are shown in Figure 4. The digestible organic matter intake followed patterns very similar to the percentage IVDOM of oesophageal samples. A decrease in DOM intake was generally evident in the cases of lupin, dry beans and maize residues. On soybean, sunflower and sorghum residues, DOM intake was relatively constant over the grazing periods. There was, however, a general tendency for DOM intake to increase over the first few weeks of the grazing period and then to decrease, except in the case of soybeans in Season 1.

At the commencement of grazing, sheep on lupin and maize residues had the highest DOM intakes, viz. 853 and 852 g/d respectively. Schoonraad (1985) found with sheep on the maize residues an intake of 1760 g/d, which is higher than the 852 g/d found in this study. It can possibly be attributed to more grain available on the maize residues.

In both seasons, DOM intake of sunflower at commencement of grazing was low. It was possibly the result of adaptation problems, because intake increased after a few weeks.

The poor performance of sheep on dry beans (Esterhuysen *et al.*, 1991) in Season 2 was in accordance with observed low intakes (Figure 3).

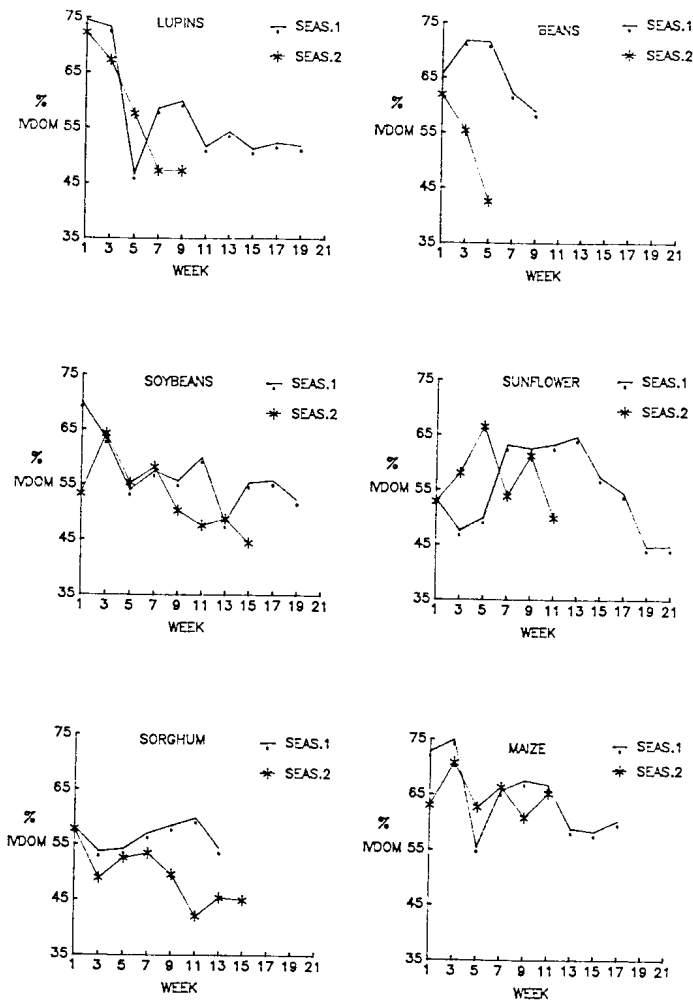


Figure 3 Percentage IVDOM of oesophageal samples.

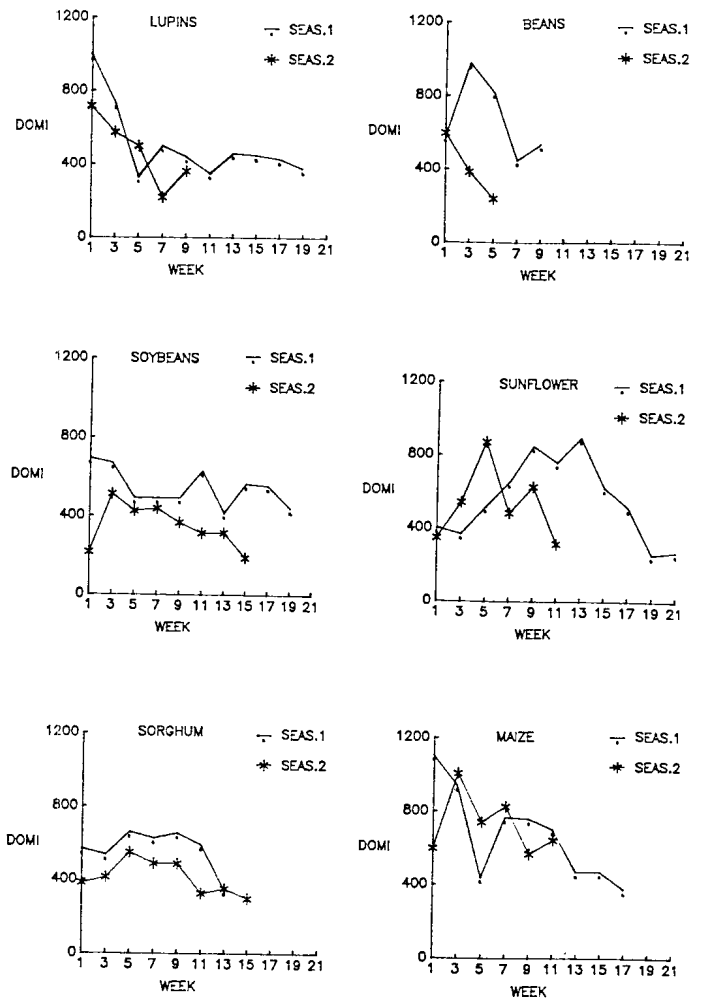


Figure 4 Digestible organic matter intake by sheep (g/d).

Crude protein intake

The protein intake of sheep (g/d) is given in Figure 5. Protein intake followed much the same trend as the percentage crude protein in the oesophageal samples. Sheep on lupin residues in both seasons had the highest intake with commencement of grazing, viz. a mean of 322 g/d for the two seasons.

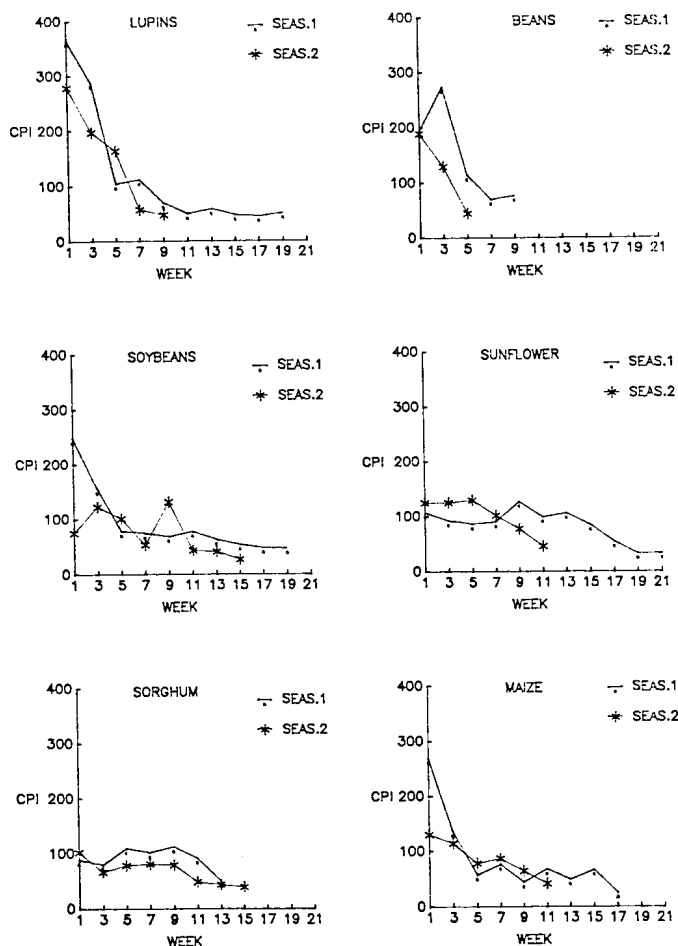


Figure 5 Crude protein intake by sheep (g/d)

The general trend for protein intake was to decline with time. It can be attributed to the lowered availability of grain, as well as the fact that material with higher nutritional value was first selected by the sheep. Additionally, weeds which had grown after the winter rain could have influenced protein intake.

Sheep on soybean residues showed with collection 1 in Season 2 a very low CP intake as a result of low DOM intake. Protein intake of sheep on the sunflower and sorghum residues declined little with time. This can possibly be attributed to the small quantity of grain available. This was probably also the case with sheep on the maize residues in Season 2. In the first week of grazing maize residues a protein intake of 200 g/d was found which was similar to the 237 g/d found by Schoonraad (1985).

Conclusions

Crop residues are grazed very effectively by sheep. With commencement of grazing the nutritional value of the crop residues are generally sufficient for sheep to increase mass (Esterhuysen *et al.*, 1991).

At the start of grazing sheep select the grain first. From a sheep production point of view it is an advantage that more grain is available on the harvested land. However, sheep should be adapted to the grain of the residues that are to be grazed, otherwise acidosis may occur. The selection of the grain has a further advantage in that self sown seedlings are minimized in the next season.

Initially the crude protein and IVDOM of the residues should be sufficient for production, but quality decreases gradually as especially the grain is utilized. Only stems and stalks remained on the lands at the end of the grazing periods and the nutritive values according to the oesophageal samples were about 50% IVDOM and 6% CP which were generally independent of the crop utilized.

Digestible organic matter and crude protein intake generally declined with time and were dependent on the amount and quality of the material and particularly the amount of grain available. Protein should probably be supplemented to sheep. According to the NRC (1985), a 50 kg dry sheep needs 550 g DOM and 95 g CP/d for maintenance. The crop residues could only support these requirements for a few weeks.

Acknowledgements

The authors wish to thank the laboratory personnel of the Nootgedacht Research Station for chemical analysis and Mr D.L. Barnes for his comment.

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