Chapter 4

Summary and Conclusions

The aim of this study was to determine the nutritional differences between two drought resistant leguminous forage species in comparison with the well-known forage legume, lucerne. Chemical composition, certain rumen parameters and digestibility were measured.

The mean CP concentration differed between species with *C. sturtii* having the lowest CP and *M. sativa* the highest. The nitrogen retention for all species was positive with *C. sturtii* being the lowest. These values compare well to the CP concentration of the three forages with *C. sturtii* the lowest and *M. sativa* the highest concentration.

The macro-mineral concentrations (Ca, P and Mg) of *C. sturtii* and *M. sativa* were similar and had a higher concentration than S. *microphylla*.

The trace mineral concentrations of all three plants varied. Iron concentration of all three plants differed, with *M. sativa* having the lowest concentration and *C. sturtii* the highest. The copper concentrations in *M. sativa* and *C. sturtii* were similar, while that of *S. microphylla* was slightly lower. The zinc concentrations in *M. sativa* and *C. sturtii* were similar, while that of *S. microphylla* was slightly higher. Manganese concentration of all three species differs, with *C sturtii* being the lowest and *S. microphylla* the highest.

The apparent DM digestibility of *S. microphylla* is significantly lower than *M. sativa* while it did not differ significantly from *C. sturtii*. The apparent CP digestibility of all three species did not differ significantly, however that of *M. sativa* is numerically higher. With regards to the NDF digestibility, *C. sturtii* and *S. microphylla* differ significantly to *M. sativa* with lower NDF digestibility values. The apparent OM digestibility followed the same trend as that of apparent DM digestibility. Effective DM degradability of *C. sturtii* and *S. microphylla* was similar while that of *M. sativa* was significantly higher. The effective NDF degradability for *C. sturtii* and *S. microphylla* was similar and *M. sativa* again had a significantly higher NDF degradability.

The mean CF concentration differed between species with S. *microphylla* having the highest CF while *M. sativa* had the lowest. The NDF and ADF levels of the samples followed the same trend as CF. *C. sturtii and S. microphylla* had a lot of woody material (stems) and this material

was included in the feed. Some leaf material was lost in the drying process as well. This may explain the high fibre values compared to that of the *M. sativa*. The ADL concentration of *S. microphylla* was higher than both *C. sturtii* and *M. sativa*.

S. microphylla had the highest fibre concentration, therefore leading to higher acetate concentrations than *C. sturtii* but not higher than *M. sativa,* suggesting the fibre of *S. microphylla* is less digestible. This is supported by the low apparent NDF digestibility for *S. microphylla*. The high NDF degradability of *M. sativa* shows a high fibre digestibility. Together with sufficient ME intake, is a resultant high acetic acid concentration. Lower rumen acetate concentrations in *C. sturtii* and *S. microphylla* compared to *M. sativa,* and no significant difference in propionate concentrations indicates that *C. sturtii* and *S. microphylla* may possibly contain similar amounts of readily available carbohydrates. This corresponds well to the lower ME intake and DM/NDF digestibility of *C. sturtii* and *S. microphylla*.

The average intake was very different between species, with *C. sturtii* being the lowest and *M. sativa* the highest. The animals consuming either *C. sturtii* or *S. microphylla* tended to lose body weight during the experimental period, while those eating *M. sativa* gained body weight. Voluntary intake parameters of *C. sturtii* and *S. microphylla* were lower and differed significantly between *M. sativa*. The DM intake of *M. sativa* was higher than both *C. sturtii* and *S. microphylla*.

Increased OM intake and apparent digestibility have been reported to increase microbial production (Clark *et al*, 1992). This corresponds well to all values in this trial with *M. sativa* having a higher CP concentration and OM digestibility as well as a significantly higher DOMI.

The higher NDF degradability and voluntary intakes of *M. sativa* compared to those from *C. sturtii* and *S. microphylla* could result in lower rumen retention time and greater turnover of particulate matter from the rumen of sheep. *C. sturtii* had the highest percent NDF passing from the rumen with the lowest NDF digested in the rumen. The retention time was longer (slower rate of passage, Kp); however this didn't improve NDF digested in the rumen. Therefore there may be other possible factors affecting digestibility of this forage.

Intake is more related to the rate of digestion than the digestibility, therefore rapid digestion should increase intake, which is the case for *M. sativa.* The rate of digestion and intake for *S. microphylla* was higher than *C. sturtii* but it has a higher NDF and lignin (ADL) concentration

possibly leading to an assumption that the distribution of lignin is having an effect on rate of digestion (McDonald *et al.*, 2002).

In conclusion; both *C. sturtii* and *S. microphylla* had a higher concentration of all fibre components, thus decreasing intake significantly compared to *M. sativa*. The low nitrogen retention of *C. sturtii* reflects in the live weight losses of those animals eating *C. sturtii.* The only animals to gain body weight were those in the treatment group of *M. sativa*. The reduced N retention of the *C. sturtii* and *S. microphylla* compared to *M. sativa* could be attributed to the low acceptance of this feed as indicated by low intakes.

Both *C. sturtii* and *S. microphylla* had a lower nutritional value compared to *M. sativa.* The effect of all fibre parameters, digestibility values and rumen parameters correspond well to the relative voluntary intake parameters. Low intake is the biggest factor affecting the decisions to supplement with these forages during dry periods. If these two leguminous fodder species were to be used as maintenance feed, some other supporting source of energy would need to be supplied in order for these sheep to be maintained over a long period.

The effect of anti-nutritional factors present in *C. sturtii* and *S. microphylla* on the digestibility of forages and nutrient contribution from forages needs to be studied to determine if these play a role in reducing the nutritional value.