Chapter 3

Summary, Conclusions and Recommendations

The aim of this study was to identify three palatability classes, or groups. within *A. nummularia* cv. Hatfield Select and to identify the differences in chemical composition of these three groups. The factors most likely to influence the palatability were identified. The differences in rumen degradability of these three groups were determined as was the degradability between goats and sheep. From these studies the factors identified as influencing palatability, as well as the nutritive value of the treatments, can be used to select a cultivar that will be palatable to grazing animals and that can be utilized by these animals for maximum production.

Goats and sheep were used to identify the most-palatable or preferred *A. nummularia* cv. Hatfield Select plants during a grazing period. Young tender edible plant material was then harvested by hand and used to determine the chemical composition of these three palatability groups. These three palatability groups were also used to determine the degradability of the plant components, as well as to compare the degradability of the treatments by goats and sheep.

There were significant differences in the CP concentration between the most- and least-palatable groups. The most-palatable plants had a CP concentration of 24.38%, which was higher than the least-palatable group (21.53% CP). This is supported by the results obtained by Norman *et al*. (2004), who found that *A. nummularia* had a significantly higher CP concentration in the most preferred plants. According to Welch and Monsen (1981), the higher CP concentration in the most-palatable plants could be of genetic origin. This will make it possible to select palatable *A. nummularia* cv. Hatfield Select plants with a high CP level. From these high CP concentrations, more than enough CP should be provided for animal production and certain levels of growth, pregnancy and lactation for both sheep and goats (NRC, 1981; NRC, 1985 and EAAP, 1991).

The most-palatable plants had a non-significant lower NDF concentration (41.62%) than the least-palatable plants (45.51%). It can thus be concluded that the cell wall fraction increases with a decrease in palatability. The high cell wall fraction should, in future, also be analyzed for the less digestible fibre fractions (ADF and ADL). These fractions will give a complete assessment of the true influence of the cell wall fraction on digestibility.

The most-palatable plants also had higher concentrations of all the macro minerals determined (Ca, P, Mg, K, Na and Cl^-) than the least-palatable plants. Only P and Mg, however, had significantly higher concentrations in the most-palatable than the least-palatable plants. The most-palatable group had a P concentration of 2.51 g/kg and the least-palatable group 2.04 g/kg. This positively correlated influence of P on palatability was also reported by Jacobs and Smit (1977). The Mg concentration in the most-palatable plants was 7.73 g/kg while that in the least-palatable plants was 6.59 g/kg. This significantly higher concentration of Mg in the most-palatable plants than the least-palatable plants was also reported by Jacobs and Smit (1977). The salt content, especially NaCl, of *Atriplex* is generally this plant's main determinant of palatability (Jones and Hodginson, 1969; Hoon *et al*, 1991). This was not true for the current study, as the NaCl concentrations were very low and had no significant effect on palatability. The NaCl concentrations in the current study were in contrast to the statements of Jones and Hodginson, (1969); Hoon *et al*, (1991) and Casson *et al.* (1996) that a high salt content relates negatively to palatability. Within the trace elements determined (Cu, Mn and Zn), Cu had a non-significant decrease in concentration while Mn and Zn concentrations increased non-significantly with palatability. To summarise, the factors that significantly influenced palatability, were increases in the CP, P and Mg concentrations.

A. nummularia cv. Hatfield Select provides enough CP for production in both sheep and goats. Production can also be sustained for goats and sheep, provided that P, Cu and Zn are supplemented. Maintenance requirements of all

the minerals can be provided except for Cu. From the results it would be advisable to supplement animals grazing *A. nummularia* cv. Hatfield Select with Cu, but it would depend on soil conditions.

Goats had a significantly higher percentage of effective degradable DM, of *A. nummularia* cv. Hatfield Select, in the most- and medium-palatable plants, than sheep. The rate of DM degradation was also non-significantly higher in goats than in sheep. In the most- and medium-palatable groups, goats had a significantly higher percentage of effective degradable N, than sheep. Goats had a non-significant higher rate of N degradation than sheep. There was no significant difference in the % of effective degradable NDF between goats and sheep but goats did tend to have a slightly higher % of effective degradable NDF. Goats had a significant higher rate of NDF degradation, in the most- and medium-palatable plants, than sheep. This higher extent and rate of DM, N and NDF degradation is an indication that goats are better able to digest *A. nummularia* cv. Hatfield Select in the rumen than goats. The higher N degradation will result in a higher rumen NH_3-N concentration and possibly higher microbial protein synthesis in goats. This will give a better utilization of dietary N by goats than by sheep. The non-significant higher NDF degradation by goats indicates a higher digestion of the fibre component of the diet by these animals. This higher digestion of the cell wall component will result in the production of higher levels of acetic and propionic acids in the rumen. If enough propionic acid is produced from hemicelluloses and the cell contents, these VFA will be able to provide enough energy to the animal for production. *A. nummularia* is known as a maintenance forage with a small production potential (Le Houerou, 1991). This is because of a shortage in metabolisable energy. In a subsequent chapter, low VFA concentrations will illustrate the shortage in energy.

Within goats, there was a significant lower percentage of effective DM degradability in the least-palatable (74.57%) than the most-palatable (76.24%) plants. This was not noted with sheep, which had small differences in the

percentage of effective degradable DM. Within goats and sheep, there was a non-significant lower rate of DM degradation in the least-palatable than the most-palatable groups. There was a significantly higher percentage of N degradability in the most-palatable than the least-palatable plants with goats. In sheep, this difference was, however, non-significant. Goats also had a significantly, and sheep a non-significant, higher rate of N degradation in the most-palatable than the least-palatable plants. Within goats there was a non-significant increase in the NDF degradation with increasing palatability. For sheep, just the opposite was true. Goats did, however, exhibit a significantly, and sheep a non-significant, higher rate of NDF degradation with an increase in palatability. With enough energy and high enough intakes, this fodder has enormous potential for animal production. These overall higher DM, N and NDF effective degradabilities and rates of degradability for the most-palatable plants than the least-palatable plants within goats and sheep, indicate a potentially better utilisation of the most-palatable plants than the least-palatable plants. There could thus be selected for a more palatable and higher potential *A. nummularia* cultivar from this population. The higher N degradability of the most-palatable plants indicates a higher microbial population and thus a higher utilization of the dietary material by the ruminant. The higher DM degradability indicates that the most-palatable group would have a higher over-all digestibility than the least-palatable group. The most-palatable treatment would also have a better utilisation of the potential energy of the plant. This is because of the higher NDF degradability of the most-palatable group than the least-palatable group, resulting in a higher production of VFA by the rumen micro flora.

From the above, it appears that there can be selected for a highly palatable cultivar which will also increase the nutritional value of *A. nummularia* for both goats and sheep. This more palatable cultivar will also have a better utilisation by animals. This fodder crop can be used as a maintenance diet and if it does not contain too high a salt concentration which is linke to local soil conditions, it will be relatively palatable.