

CHAPTER 4

4. GENERAL DISCUSSION

The objective of this study was to evaluate the dry matter production, intake and the nutritive value of *Indigofera* species. This was done by analyzing the chemical composition (ash, crude protein and neutral detergent fibre), *in vitro* digestibility of organic matter and minerals (Ca, P, Mg, Cu, Zn and Mn). The dry matter yields of all five plant species were measured as well as the leaf:stem ratio. The voluntary intake trial which was conducted, compared *Indigofera* species with *L. leucocephala* and lucerne as a control.

4.1 Dry matter production

There were higher leaf DM yields in autumn 2003 than in autumn 2004 and spring, however, *I. amorphoides* appeared to have higher leaf DM yields in both years (Table 3.1). As shown in Table 3.2 and Table 3.3, *I. amorphoides* and *I. arrecta* had the highest DM yields in both years.

4.2 Leaf to stem ratio

There were significant differences in leaf to stem ratio between the seasons (autumn and spring) during 2004 (Table 3.4). In the autumn, all the *Indigofera* species, except for *I. arrecta*, had a lower leaf:stem ratio, with the proportion of stem increasing with ageing of the plants. The highest leaf:stem ratio for *I. arrecta* (52:48) was coupled with a crude protein concentration of 18.24% followed by 13.71% obtained during autumn (2004) and the lowest NDF concentration of 59.50% (see Table 3.4 and Table 3.10). Akin *et al.* (1977) and Ballard *et al.* (1990) reported that advancing maturity is associated with a declining nutritive value as a result of a decrease in leafiness and an increase in proportion of stem material.

The lower CP concentration in the edible component during autumn of 2004, had a positive correlation with a decrease in leaf:stem ratio (Table 3.4). However, in the spring of 2004 there was an increase in the leaf:stem ratio of 59:41, 59:41, 57:43, 57:43 and

52:48 for *I. amorphoides*, *I. cryptantha*, *I. costata*, *I. viciodes* and *I. arrecta* respectively (Table 3.4). A higher proportion of leaf to stem ratio in the spring, as illustrated in Table 3.4, was correlated with a higher Zn concentration in *I. amorphoides* and *I. cryptantha*. Dougall and Bogdan (1958) reported that as the plant matures mineral contents (Cu, Zn and Fe) decline.

4.3 Chemical composition

In the autumn of 2004, there was a marked lower ash concentration in all the species as a result of advancing maturity of the plants. *I. viciodes* had the highest ash concentration. A high ash concentration was found in the edible component during the spring of 2004 of all the species, when compared to autumn of the same year. This was because of a higher leaf to stem ratio (Table 3.4). *I. amorphoides* and *I. cryptantha* had the highest ash concentrations in autumn and spring of 2004 respectively. In the autumn of 2003 and 2004 (leaves), *I. cryptantha* and *I. costata* had the highest CP concentration (Table 3.7).

There was, however, a dramatic increase in CP concentrations in the spring of 2004 in all the species, with the highest being in *I. cryptantha* (28.74%). Most importantly, all the species in this study have more than 8% CP, which was regarded by Leng (1997) as the optimum level for maintenance requirements for mature ewes. The CP concentrations in all the species in this study were relatively high. It is known that CP concentration is positively related with quality (high protein forages are generally high quality forages). Livestock fed *Indigofera* species will not, therefore, require protein supplements. This firstly reduces the feed costs, since most of the protein supplements are purchased, and secondly there will be an increase in production.

The lowest NDF concentration in the leaves of *I. amorphoides* was found in both years with 18.9% and 40.2% (Table 3.10). The lower NDF concentration in edible components during spring of 2004 is most likely the result of lower lignification and a higher leaf:stem ratio (Table 3.4).

4.3.1 *In vitro* digestibility of organic matter (IVDOM)

The IVDOM of leaves in the autumn of 2003 was the highest in *I. amorphoides*, while in autumn of 2004 it was for *I. viciodes*. A marked increase in the *in vitro* digestibility of organic matter of edible components of *I. cryptantha* in the spring of 2004 is ascribed to the higher proportion of leaf material (Table 3.4).

4.3.2 Minerals

4.3.2.1 Macro elements

The concentrations of Ca, P and Mg recorded in the *Indigofera* species, in this study, will satisfy the nutrient requirements of animals in both seasons. There was a marked decrease in Ca concentration in leaves of all the species from 2003 to 2004 (Table 3.13). However, *I. amorphoides* had the highest Ca concentration in both 2003 and 2004. As shown in Table 3.13, there was a marked increase in Ca concentration of the edible component of *I. amorphoides* during spring. The P concentration in leaves of *I. cryptantha* and *I. viciodes* during 2003 and 2004 appeared to have higher values than the other species (Table 3.15).

4.3.2.2 Micro elements

The micro-element concentrations in all the species will fulfill the micro-mineral requirements of sheep. During autumn of 2003, the Cu concentration in leaves of *I. viciodes* appeared to be higher than the other species. There was, however, a decrease in Cu concentrations in autumn of 2004 in all the species. During the autumn and spring of 2004 Cu concentration in the edible component did not differ significantly within and between the species (Table 3.18).

The Zn concentration in *I. cryptantha* was consistently the highest for both leaves and edible components (Table 3.20). Unlike the Cu and Zn concentrations, the Mn concentrations showed an increase with age in the autumn of 2004 (leaves) and the spring of 2004 (edible components) in this study. During 2003 (leaves), *I. arrecta* had the highest Mn concentration value, whereas *I. amorphoides* proved to be good forage. In the autumn and spring of 2004, the edible component of *I. arrecta* appeared to have the highest Mn concentrations (Table 3.21).

4.4 Feed intake and digestibility

Lucerne had significantly higher OMI and DOMI than *Indigofera* species and *L. leucocephala*. However, *L. leucocephala* appeared to be slightly better than *Indigofera* species though there were significant differences (Table 3.23). *Indigofera* species was found to have a higher NDFI than lucerne or *L. leucocephala*, while, lucerne did not differ significantly from *L. leucocephala*. Lucerne appeared to be higher in OMD than both *L. leucocephala* and *Indigofera* species, with no significant differences being found between lucerne and *Indigofera* species. However, *Indigofera* species had a higher NDFD than the other forages.