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MAIZE SILAGE

A study of the nutritive value of ensiled ZEA MAYS L.
for growth in young cattle

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ABSTRACT

An experiment is described in which the nutritive value of New Zealand produced maize silage, harvested at the dent-glaze stage of maturity, was investigated. Of central interest in the study was the adequacy of the protein content of the maize silage for supporting growth in young cattle.

Following a six-week standardisation period, 15 Friesian steers, eight months of age, were each allocated to one of three treatments in an experiment of randomised block, covariance design. While maize silage either alone (MS) or supplemented with hiuret (MSB), formed two of the treatments, it was considered necessary to include a ration of better known nutritive value as a form of control. Hay and barley meal (HB) was selected for this purpose.

During a six-week comparison period, ration physical and chemical analyses were made; dry matter (DM) and component digestibilities and intakes, nitrogen (N) utilisation, and liveweight gain by the steers were measured. Identical recordings were made during the standardisation period for use in covariance analyses. Throughout the study emphasis was placed on animal performance (liveweight gain) as the prime criterion of nutritive value, the other parameters measured being considered to characterise that nutritive value as components of it.

Mean rates of liveweight gain during the comparison period were similar for all three groups (0.44, 0.52 and 0.51 kg/day for the HB, MS and MSB treatments respectively). Liveweight gains adjusted for DM intake, however, significantly favoured the MSB treatment in comparison with the HB ($P < 0.05$) and MS ($P < 0.10$) treatments.

The possibility that this superior efficiency of the MSB treatment was a result of unaccounted bias is discussed. Notwithstanding the reasonably convincing evidence presented in favour of the reliability of the finding, the possibility that it was merely an artifact could not be unequivocally excluded.

The apparent equivalence of the MSB treatment to, if not superiority over the HB treatment, was difficult to reconcile with the recorded DM digestibilities and digestible energy intakes (62, 14.7 megacals./day and 67, 18.1 megacals./day respectively, for the MS and HB treatments). Enhanced efficiency of utilisation of metabolisable

energy mediated via increased post-ruminal digestion is suggested as a possible explanation for this unusual finding.

If the efficiency advantage of the MSB over the MS treatment was truly a nutritional effect, it can only be ascribed to the presence of biuret in the former ration. While evidence presented would suggest some utilisation of the supplemental biuret by the rumen microbes, the extent is clearly indicated by the N retention results to be limited.

It was found that New Zealand produced maize silage, harvested at the dent-glaze stage of maturity (33% DM) had physical and chemical compositions closely approximating those of the American produced material. When fed as a sole ration to young growing cattle, levels of DM intake (2.6-2.7% of liveweight) potentially conducive to rapid rates of liveweight gain (i.e. greater than 0.75 kg/day) may be expected. The present results would however suggest that the digestibility of the gross energy (61%) may impose a ceiling of 0.75 kg/day on potential rates of gain. The possibility of bias in the estimation of both intakes and digestibilities, resulting from the use of the oven-drying technique in determining silage DM contents, is discussed. It would seem that both the DM digestibilities and digestible energy intakes recorded in the present study, may be consistently low.

It is concluded that maize silage with a 9-10% crude protein content can support growth rates in young cattle of 0.5 kg/day, at least in the short term. With the intake and digestibility data recorded in the study described being of a level sufficient to support greater rates of liveweight gain, it would seem reasonable to suggest, assuming no vitamin or mineral deficiencies, that protein availability to the steers fed maize silage was limiting growth rate. The present study does support a response to N supplementation (biuret) although the finding is adopted with caution. The evidence is inconclusive.

It is therefore suggested that the need exists for a further more specific study of the adequacy of the protein content of maize silage for growth in young cattle. A longer period of maize silage feeding, and the inclusion of a treatment containing a natural protein supplement would be considered essential.

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PREFACE

Progress in pasture management has resulted in more efficient utilisation of available grass by the grazing animal and concomitantly, increased production of milk, meat and wool. The point has now been reached, however, where the amount of grass actually grown is limiting further increases in animal productivity. Possible means of lifting this annual herbage production would include the use of nitrogen fertilizer, irrigation, or high yield forage crops.

While the use of both nitrogen and irrigation on pastures can be clearly beneficial, their potential seems limited by the very morphology and physiology of the pasture plant. Without the limitations imposed by the grazing animal, the use of high yield forage crops may have the greater productive potential.

Maize (*Zea mays* L.) is one of the most productive forage crops known to New Zealand and when used as silage, provides an animal feed at quite low cost, comparable with grass silage. Its characterisation in New Zealand however, is still in initial stages.

While extensive work on maize silage has been reported in the United States, extrapolation of their findings to our vastly different conditions is difficult. Emerging from their work, however, with singular clarity, is the confused understanding of the protein adequacy of maize silage for growing animals.

The study described herein was designed to investigate the nutritive value of New Zealand produced maize silage as a sole ration for young growing cattle, with emphasis on the adequacy of its protein content.

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