Measurement of Barley (*Hordeum vulgare*) feed quality parameters *In Sacco* and mapping of associated Quantitative Trait Loci (QTL) in Cattle

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Peter Wolfgang Gous

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Abstract.

Barley (*Hordeum vulgare*) is a major feed source for the livestock industry. Its competitiveness against other cereal grains such as wheat, oats, maize and grain sorghum depends largely on its price per unit of expressed feed quality. The traits which contribute to feed quality in barley are largely quantitative in nature but little is known about their genetic control and few studies have attempted to identify these quantitative trait loci (QTL).

A study to identify the QTLs associated with feed quality was performed using a F6 – derived recombinant inbred barley population from a Tallon x Scarlet cross. 117 unique lines from the Tallon x Scarlett population, for which a genetic map is available, were used. Samples from each line were incubated for three hours in the rumen of fistulated cattle, recovered, washed and dried for analysis. Both the original samples (pre-) and the post-digestion residue were analysed for key grain traits of feed quality, namely acid detergent fibre (ADF), starch, protein and *in sacco* dry matter digestibility. Analysis was performed using both analytical chemistry and NIR techniques.

The phenotypic results and data were used to identify genomic regions (QTL) associated with these traits. Putative QTLs were found on chromosome 2H, 3H, 5H and 7H. However, numerous suggestive QTLs were found throughout the barley genome. Genetic markers that define these QTL will be an effective tool for the selection and improvement of feed barley in the future. Additionally the research showed that the development of NIR calibrations appropriate for the detection of post-digestion nutrient measurement is essential for its establishment as a rapid, non-destructive feed quality measurement technique. This study also validated the ability of these QTL analyses to be performed under Australian conditions and with local feed grains and animals.
**Declaration**

I certify that the ideas, experimental work, results, analyses, software and conclusions reported in this dissertation are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

__________________________  _________________________
Signature of Candidate       Date

Peter Wolfgang Gous

**ENDORSEMENT**

__________________________  _________________________
Signature of Supervisor/s    Date

Professor Mark Sutherland (USQ)

__________________________  _________________________
Signature of Supervisor/s    Date

Dr. Glen Fox (DEEDI)
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