

### What is marbling?

Marbling refers to the intramuscular fat within the muscle of beef cuts. On a steak it is seen as white streaks or flecks of fat on the cut surface.

There are breed differences for marbling with research showing that the British breeds (and most dairy breeds) have a greater propensity to marble than European and *Bos indicus* breeds. Two Asian breeds, Japanese Wagyu and Korean Hanwoo have the highest marbling potential amongst measured breeds. The heritability of marbling is considered to be 35 – 40%.

### The importance of marbling

Marbling has long been associated with enhanced eating quality and palatability of beef and other meats, for example pork. A commonly held perception is that higher marbling leads to more tender beef, however the association is quite low explaining 10-15% of the variance in taste-panel tenderness scores.

More recent research has confirmed the positive relationship of marbling with other measures of eating quality - the flavour and juiciness score. More marbling is associated with greater palatability up to a certain level, which differs in different countries according to their tastes. Marbling is an integral part of most beef grading schemes.

Many markets for high quality beef e.g. USA and Japan, pay premiums for higher marbling score and increasingly top chefs and branded beef programs around the world demand a certain level of marbling in their beef. A percentage of marbling in a steak minimises the risk of it drying out during cooking.

### GeneSTAR® Marbling 4

GeneSTAR® Marbling 4 is an important component of the GeneSTAR® multi-marker DNA test for 3 important traits namely, Marbling, Tenderness and Feed Efficiency (currently 4 markers per trait).

The result for each marbling marker in the test is either 0, 1 or 2 STARS, where a STAR always refers to the favourable form (allele) of the marker.

Potentially therefore an animal could have a result between 0 and 8 STARS for Marbling 4. The four marbling DNA markers are independent and additive. This means that the result for each marker has individual value and adding the four individual results together predicts the total effect of the markers.

The Marbling 4 test has been evaluated on more than 1000 steers fed on a high percentage grain/concentrate ration, that have been slaughtered and have had their actual carcass marbling scores measured by accredited assessors. Figure 1 shows the results of an analysis of the results. You can note the incremental increase in marbling score with the increase in STARS from the GeneSTAR® Marbling 4 test. Please note that there are no 8 STAR Marbling animals included in this group of animals.

**Figure 1: The effect of number of STARS on marble score from carcasses**

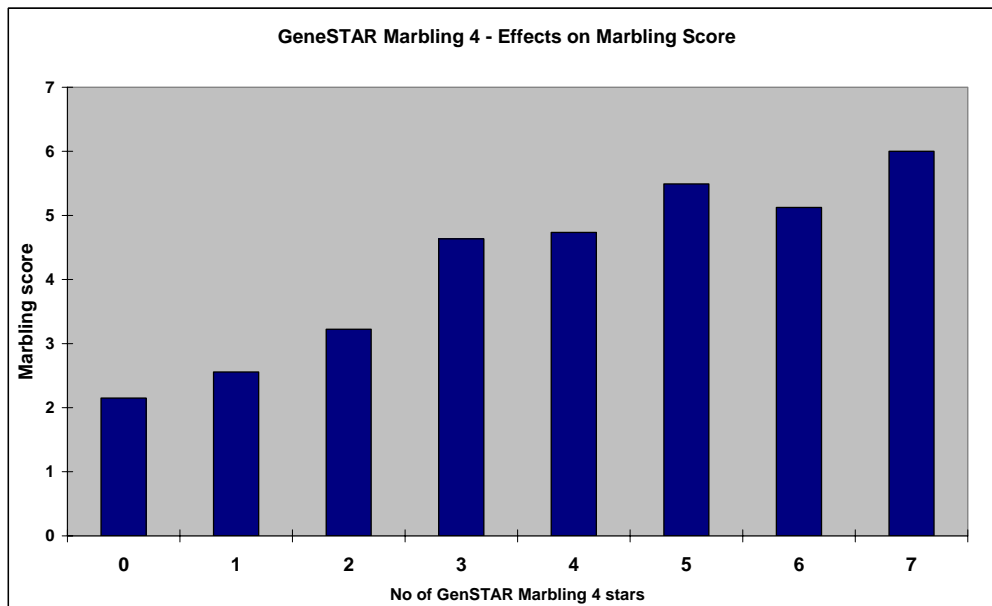


Figure 2 below shows the difference in average marbling scores of two sets of steers from the same group, separated on the basis of their GeneSTAR<sup>®</sup> Marbling 4 result. The lower score group shows the GeneSTAR<sup>®</sup> 0 and 1 STAR results and the higher score group the 2 - 7 STAR results (there were no 8 STAR animals in this group).

It can be seen that the 2-8 STAR group showed a 1.5 marble score advantage (3.5 vs 2) over the 0-1 STAR group.

**Figure 2: The effect of grouping carcasses with 0-1 STAR and 2-8 STAR on average Marble Score**

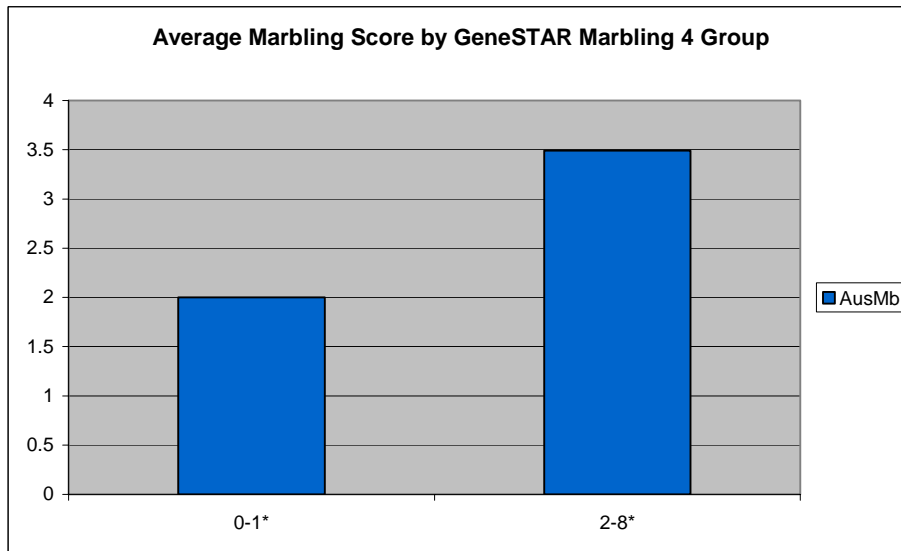
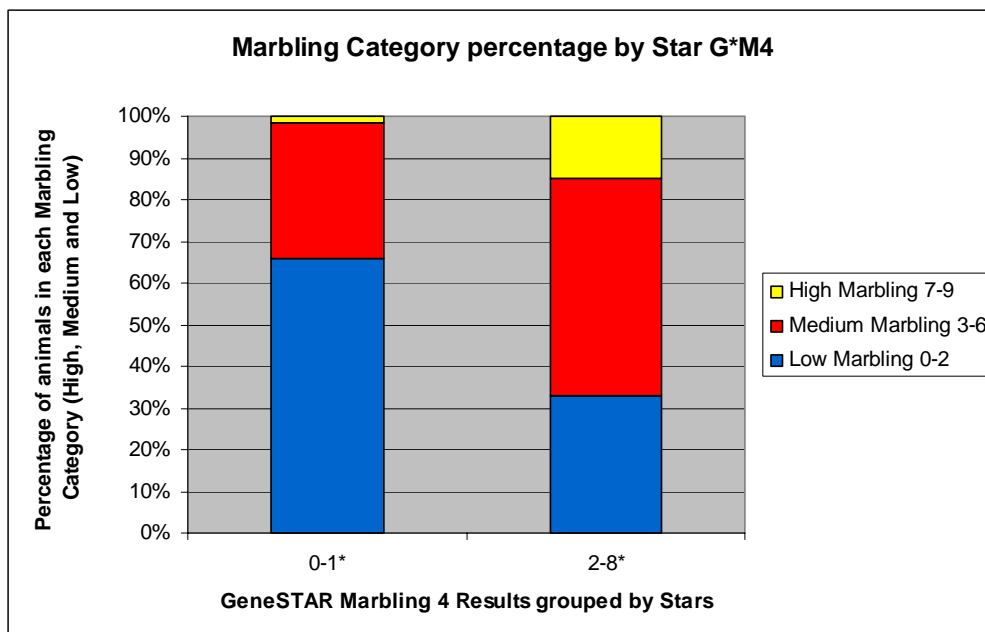


Figure 3 represents the percentages of cattle in each GeneSTAR<sup>®</sup> group that fall into 0-2, 3-6 and 7-9 marble score groups based on Aus-Meat Marbling Scores. The second group of 2-8 star animals has a substantially higher percentage of animals achieving a marble score 7 or better, and only half the percentage of animals falling into the 0-2 marble score category. For cattle aimed at long-term grain feeding for markets where marbling is important, sorting cattle into these two groups can make a substantial impact on group kill data and feeding margin.

**Figure 3: The effect of grouping carcasses with different STARS on Marble Score category**

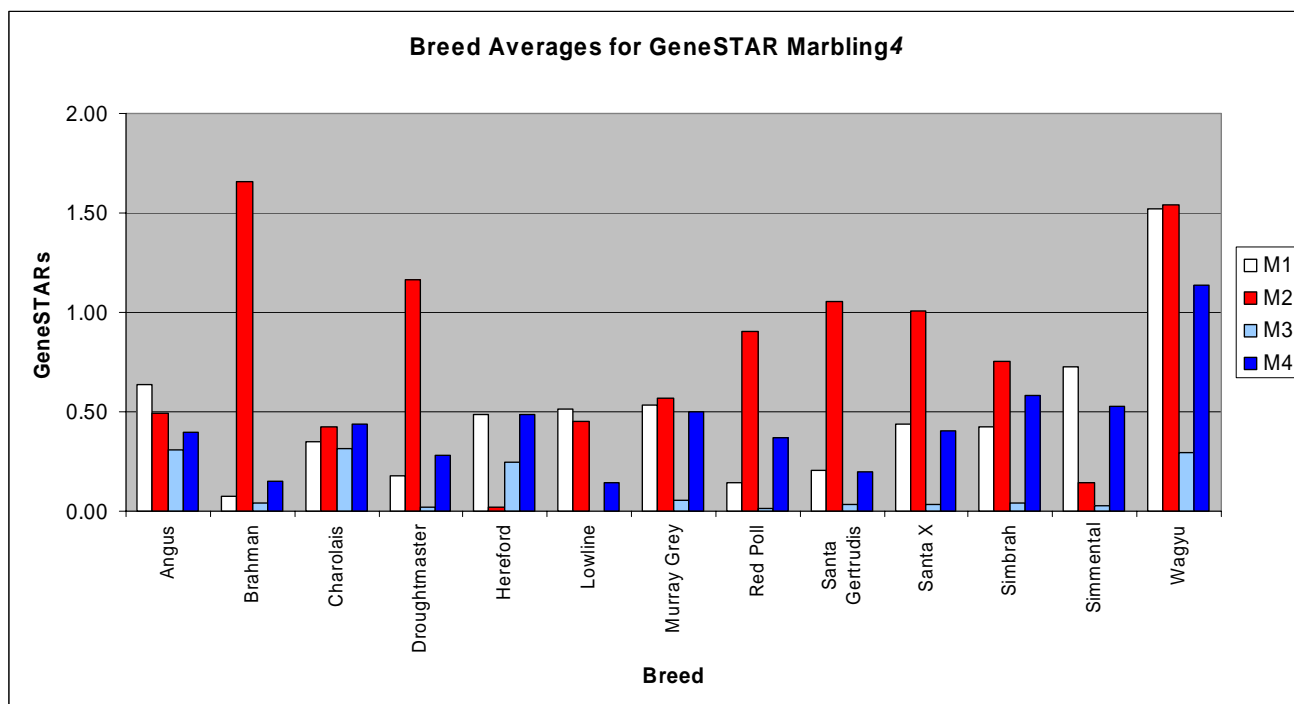


## STAR averages by breed for the 4 Marbling markers

The average STAR score (0-2) for each of the 4 markers is shown in Figure 4. You will note differences within a breed for each marker as well as between breed differences. Care should be taken in using these averages to infer differences between breeds for overall marbling potential as these four markers represent only part of the marbling picture; there are other genes that impact on marbling that are not yet included in this test.

These averages should be used to assess the scope of improvement of the frequency and average score of an individual marker within a herd or breed.

**Figure 4: Breed average STAR rating for each of the markers in GeneSTAR Marbling 4**



## Conclusions

A four-marker test for Marbling is available as part of a combined three—trait test for Marbling, Tenderness and Feed Efficiency. Cattle breeders aiming to improve these traits should use the test in their selections to increase the number of 2-STAR animals for individual markers with 8-STAR animals being the most desirable for each trait.

## Using GeneSTAR Marbling 4

As more markers for other marbling genes are added to the GeneSTAR<sup>®</sup> Marbling test, more of the genetic or observed variation in marbling for an animal will be described by the GeneSTAR<sup>®</sup> test. This will in time provide the ability to draft or sort commercial cattle on marbling potential and manage these cattle differently. For example, cattle that have more STARS are more likely to marble and would be suited to a specialist feeding program aimed at markets that give marbling premiums, whereas cattle that have less STARS might be more suited to a feeding program that has lesser requirements for marbling score.