

Igenity[®] BeefxDairy: A Genomic Tool for Identifying Genetic Merit of Beef on Dairy Cross Calves

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We investigated the genomic breed composition as well as the relationship between genomic prediction of performance and actual phenotypic harvest and performance data in a BeefxDairy study population of 1,002 feedlot cattle. Samples were taken on 438 steers and 564 heifers, which had approximately 55% beef influence and 45% dairy influence. Statistical analysis (R software) demonstrated positive correlations between Igenity[®] scores and phenotypic performance of 0.29, 0.23, and 0.22 for marbling (MARB), average daily gain (ADG), and hot carcass weight (HCW), respectively. When ranking cattle according to Neogen's Terminal Index and comparing the top quartile (average = 6.71) to the bottom quartile (average = 5.22) of animals, phenotypic performance was significantly different for ADG (1.32 kg/d vs. 1.24 kg/d, $P < 0.001$, respectively), HCW (390.6 kg vs. 372.2 kg, $P < 0.001$), and USDA yield grade (2.59 vs. 2.43, $P < 0.05$). Based on August 2022 grid pricing, this resulted in a ~US\$78 difference in individual carcass revenue, per head between Terminal Index top quartile and bottom quartile. The Igenity[®] BeefxDairy has shown to be a viable opportunity to manage animals relative to their genetic potential during the feeding period, representing an appropriate investment of precious feedstuffs and improving the production footprint of beef production out of dairy cows.

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The use of genomic information can provide more reliable estimates, which are essential for designing or refining selection indicators in cattle breeding programs (Pedrosa et al, 2023; Guinan et al., 2023). Many farms are utilizing beef semen on the dairy cow inventory, which they need to maintain and get more lactation out of due to development costs (NAAB, 2022). Beef production from dairy cows offers a unique opportunity to utilize animals that are less suitable for dairy herd replacement. However, optimizing their growth and carcass quality requires efficient management strategies. This study aims to evaluate the effectiveness of Igenity[®] BeefxDairy, a novel genetic testing technology, in identifying the genetic potential for growth and carcass traits in dairy herds.

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- Cattle for this study were sourced as Beef x Dairy cross cattle entering commercial feedlots in the summer and fall of 2020.
- Samples for Igenity BeefxDairy (Neogen Corporation) genetic testing were collected with tissue sampling units (TSUs, AllFlex) at time of arrival into the feedlot with other feedlot entry processing activities.
- Cattle (438 steers and 564 heifers entered the feedlot at an average of 570.1 pounds (or ~258.5 kg) and were fed an average of 274.1 days with average hot carcass weight at harvest of 844.6 pounds or 383.1 kg (Table 1).

Table 1. Summary statistics for carcass traits, closeout data, and Igenity scores

| Variable | n | Mean | SE | Range |
|---------------------------------|------|--------|------|--------------|
| Enrollment wt, lb | 1002 | 570.09 | 3.22 | 355 to 950 |
| Days on feed, d | 1002 | 274.11 | 0.80 | 207 to 305 |
| ADG, lb/d | 1002 | 2.84 | 0.01 | 0.81 to 4.06 |
| HCW, lb | 1002 | 844.62 | 2.87 | 511 to 1149 |
| USDA Quality Grade ¹ | 1002 | 2.83 | 0.01 | 2 to 4 |
| USDA Yield Grade ² | 1002 | 2.52 | 0.03 | 1 to 5 |
| Rib-eye area, sq in | 1002 | 13.86 | 0.05 | 9.1 to 19.5 |
| Marbling | 1002 | 498.27 | 3.30 | 310 to 898 |
| Fat Thickness | 1002 | 0.49 | 0.01 | 0.12 to 1.16 |
| Igenity Score | | | | |
| Average Daily Gain | 1002 | 5.88 | 0.03 | 3 to 9 |
| Marbling | 1002 | 5.73 | 0.04 | 2 to 8 |
| HCW | 1002 | 6.47 | 0.04 | 2 to 9 |
| Igenity Terminal Index | 1002 | 5.97 | 0.02 | 3.9 to 7.9 |

¹ Grades: 1 = USDA Standard or lower; 2 = USDA Select; 3 = USDA Choice; 4 = USDA Prime
² Carcasses that graded USDA Standard or lower did not receive a USDA Yield grade

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Igenity BeefxDairy Performance

Robust positive relationship was observed between Igenity BeefxDairy scores and actual phenotypic performance across both steers and heifers for average daily gain (Figure 1), marbling (Figure 2), and hot carcass weight (Figure 3).

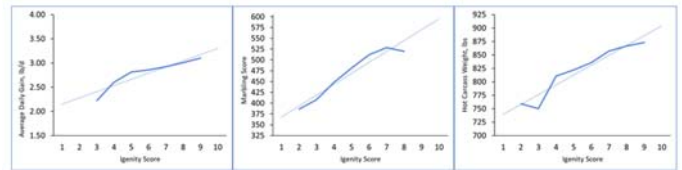


Figure 1

Figure 2

Figure 3

Phenotypic Performance

Animals in the top 25% based on Igenity[®] Terminal Index (ITI) were compared to animals in the bottom 25%. Significant ($P < 0.05$) differences were found between the two quartile ITI animals for enrollment weight, average daily gain, hot carcass weight, USDA yield grade and revenue (Table 2). Marbling score had a suggestive ($0.05 < P < 0.10$) difference between the two quartile ITI animals. This is likely due to the modest emphasis of marbling in the ITI compared to weight.

Table 2. Summary statistics and difference in revenue between the top 25% and bottom 25% of animals based on Igenity Terminal Index (ITI)

| | Top 25%, ITI | Bottom 25%, ITI | P value ¹ |
|---|----------------|-----------------|----------------------|
| Igenity Terminal Index | 6.71 | 5.22 | $P < 0.001$ |
| Enrollment Weight, lb | 586.10 | 564.03 | $P < 0.05$ |
| Days on Feed, d | 271.13 | 272.47 | $P = 0.57$ |
| Average Daily Gain, lb/d | 2.91 | 2.73 | $P < 0.001$ |
| Rib-eye Area, sq. in | 13.82 | 13.80 | $P = 0.88$ |
| Marbling Score | 504 | 489 | $P = 0.09$ |
| 12 th – rib fat thickness, sq in | 0.49 | 0.49 | $P = 0.98$ |
| HCW, lbs | 861.17 | 820.55 | $P < 0.001$ |
| USDA Quality Grade ² | 2.86 | 2.79 | $P = 0.11$ |
| USDA Yield Grade ³ | 2.59 | 2.43 | $P < 0.05$ |
| Revenue, USD ⁴ | \$1500.62 | \$1423.39 | $P < 0.001$ |
| Difference per animal | \$77.23 | | |

¹ Calculated using a two-sided t-test, $P < 0.05$ considered significantly different.

² Grades: 1 = USDA Standard or lower; 2 = USDA Select; 3 = USDA Choice; 4 = USDA Prime

Revenue for each individual animal was calculated based on the value-based pricing grid represented in Table 3. Top ITI quartile animals averaged \$77.23 more per animal than the bottom ITI quartile animals.

Table 3. Beef carcass grid premiums and discounts used for carcass revenue calculation, \$US/CWT

| USDA Quality Grade | USDA Yield Grade | | | | |
|---------------------------------------|------------------|---------|-------------------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 |
| Prime | 22.19 | 20.185 | 18.61 | 7.38 | 1.76 |
| Choice | 3.58 | 1.575 | Base ² | -11.23 | -16.85 |
| Select | -20.67 | -22.675 | -24.25 | -35.48 | -41.10 |
| Standard | -22.19 | -32.355 | -33.93 | -45.16 | -50.78 |
| Base Price, \$US/CWT: \$179.28 | | | | | |
| 400-500 lb | -29.29 | | 900-1000 lb | | -1.07 |
| 500-550 lb | -22.64 | | 1000-1050 lb | | -5.00 |
| 550-600 lb | -11.57 | | Over 1050 lb | | -16.07 |

Prices summarized from USDA National Weekly Direct Slaughter Cattle Report, August 3, 2022.

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