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Comparison of Production Levels among US Beef Breeds

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Genetic trends for beef breeds, for many traits, are on the move. The genetic trend for growth in most breeds is strongly positive. Maternal weaning weight (milk), on the other hand, is breed dependent with some breeds showing strong selection for increased milk and others slightly reducing their genetic potential for milking ability. For that reason, it is important to monitor relative differences between breeds for various production traits to assist beef producers in their breed selection decisions.

One of the greatest resources that the US beef industry has is the USDA ARS U.S. Meat Animal Research Center (USMARC) in Clay Center, Nebraska. This location delivers the primary research on breed differences to monitor how breeds have changed over time. The USMARC Germplasm Evaluation Program began in 1970 and has been monitoring breed differences since inception. This program has evaluated all influential U.S. breeds and many other unique breeds. This program has been the foundation for many of the genetic evaluation programs that include multiple breeds and allow for the computation of their Expected Progeny Differences (EPD). Additionally, the information generated from this program has been adjusted for sire sampling within breed and can be used to see how the breeds compare for various traits. This information can assist beef producers in determining which breeds work the best for their management, market, and production environment.

To assist beef producers in their task of comparing breeds, Dr. Larry Cundiff, with USMARC, developed a star system to show the level of production that each breed had for each trait. Breeds with more stars have higher values for that trait. More stars could be a benefit or a liability depending on the trait and the producer's goals and production environment. For example, more stars for marbling means the average animal in that breed is more likely to reach the Choice Grade, while having more stars for fat thickness indicated lower yielding carcasses.

This system enabled producers to easily make comparisons of breeds without getting bogged down in specific values. The last time Dr. Cundiff updated the table was in 2003 and he retired in 2007. Since that time the breeds have gone through significant changes and more traits have been studied in the USMARC germplasm program.

Table 1 is an updated version of Dr. Cundiff's original work and reflects current breed differences with additional traits. For specific values reported by USMARC, and other studies, please see **Table 2**.

Using Angus as an example, which were once considered a moderate growth breed, substantial changes in how they compare to other breeds for growth traits can be observed.

Table 1. Relative Breed Differences for US Beef Breeds

Breed*	Birth Wt. (lb)[1]	Weaning Wt. (lb)[1]	Yearling Wt. (lb)[1]	Mature Wt. (lb)[1,2]	Maternal Milk (lb)[1]	Marbling Score[3]	Ribeye Area (in^2)[4]	Fat (in)[5]	Carcass Wt.(lb)[1]	Lean to-fat[6]	BCS[7]	FE Index Steer[8]
Angus	★★	★★★★	★★★★★	★★★★	★★★★	★★★★★	★★	★★★★★	★★★★★	★	★★★★	★★
Beefmaster	★★★	★★★	★★★	★★	★★						★★★	★★★★★
Brahman	★★★★★	★★★★★	★★★	★★★★	★★★	★	★★	★★★	★★	★★★	★★★★	★★★
Brangus	★★★	★★★	★★★	★★★	★★★★						★★★	★★
Braunvieh	★★★	★★	★★	★	★★★★★	★★★	★★★★	★★	★★	★★★★	★	★★★
Charolais	★★★★	★★★★	★★★★	★★★★	★★★	★★★	★★★★	★★	★★★★	★★★★	★★★★	★★★
Chiangus	★★★	★★	★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★★
Gelbvieh	★★★	★★★★	★★★★	★★	★★★★	★★★	★★★★	★★★	★★★★	★★★	★★	★★★
Hereford	★★★	★★★	★★★	★★★	★★	★★★	★★	★★★★	★★★	★★	★★★★	★★★
Limousin	★★	★★★	★★★	★★	★★★	★★★	★★★★	★★★	★★★★	★★★	★★	★★★★★
Maine-Anjou	★★★	★	★	★★★	★	★★	★★★★	★★	★★	★★★★	★★★	★★★★
Red Angus	★	★★★	★★★★	★★★	★★★★	★★★★★	★★	★★★★★	★★★★	★	★★★★	★★
Salers	★★	★★★	★★★	★★★★	★★★★	★★	★★★★	★★	★★	★★★★	★★★	★★★
Santa Gertrudis	★★★	★★★	★★★	★★★	★★★	★★	★	★★★★	★★★	★★	★★	★★★★
Shorthorn	★★★★	★★	★★	★★★	★★★	★★★	★★	★★★	★★★	★★★	★★	★★★
Simmental	★★★	★★★★	★★★★	★★★★	★★★	★★★	★★★★	★★★	★★★★	★★★	★★★	★★
South Devon	★★★	★★	★★		★★★	★★★	★★★	★★	★★	★★★		★
Tarentaise	★★	★★★	★★		★★							★★★

Adapted from: Encyclopedia of Animal Science – Beef Cattle: Breeds and Genetics. Cundiff, 2003

Table 2. Actual Breed Differences for US Beef Breeds

Breed*	Birth Wt. (lb)	Weaning Wt. (lb)	Yearling Wt. (lb)	Mature Wt. (lb)[1]	Maternal Milk (lb)	Marbling Score	Ribeye Area (in^2)	Fat (in)	Carcass Wt. (lb)	Yield Grade[2]	BCS[1,3]	FE Index Steers[1,4]
Angus	84.7	539.2	978.6	0.0	521.1	6.19	13.71	0.663	920.8	3.27	0.00	0.000
Beefmaster	87.4	528.2	920.1	-76.1	507.8						-0.13	0.201
Brahman	94.4	557.4	928.7	20.9	513.5	4.86	13.49	0.509	859.3	2.72	0.08	0.100
Brangus	87.1	520.8	929.7	-45.0	519.0						-0.12	-0.002
Braunvieh	88.2	511.7	902.7	-194.7	528.8	5.49	14.47	0.487	853.4	2.33	-0.55	0.073
Charolais	89.5	540.8	950.2	14.3	515.8	5.34	14.57	0.463	898.1	2.41	0.00	0.070
Chiangus	87.9	507.0	907.0	-33.1	512.6	5.46	14.01	0.524	872.9	2.64	-0.17	0.130
Gelbvieh	86.5	537.8	955.6	-71.2	520.2	5.30	14.42	0.522	890.0	2.57	-0.53	0.107
Hereford	87.2	517.2	914.7	-30.4	508.9	5.31	13.50	0.590	868.7	2.96	-0.11	0.099
Limousin	85.5	530.1	926.2	-76.3	512.3	5.39	14.52	0.531	892.8	2.57	-0.40	0.206
Maine-Anjou	86.3	496.8	876.9	-62.6	503.8	5.17	14.40	0.454	855.4	2.28	-0.29	0.130
Red Angus	83.9	518.6	937.5	-47.8	521.6	5.87	13.47	0.631	885.5	3.13	0.04	-0.014
Salers	85.9	517.9	916.8	-20.1	518.7	5.17	14.39	0.475	861.1	2.35	-0.20	0.070
Santa Gertrudis	88.4	528.2	920.7	-33.1	512.3	5.11	13.32	0.579	873.2	3.00	-0.41	0.119
Shorthorn	89.0	500.9	901.9	-49.8	514.2	5.45	13.71	0.529	867.5	2.73	-0.50	0.070
Simmental	87.1	542.0	959.1	-17.0	516.1	5.50	14.45	0.501	897.5	2.54	-0.22	0.027
South Devon	88.2	506.0	893.5		518.1	5.29	13.90	0.493	850.6	2.52		-0.041
Tarentaise	86.2	523.1	892.1		505.7							0.050

They are now one of the largest mature weight and highest growth breeds, while maintaining lower birth weights and high marbling. It can also be seen that their carcasses tend to be fatter and lighter muscled compared to many other breeds at similar ages of slaughter.

Understanding breed differences for various traits can help guide beef producers in their breed selection decisions and help guide seedstock producers in making selection decisions to improve their breed for various traits.

This information reemphasizes the point that there is no perfect breed, each has their plusses and minuses. Also, remember there is much variation within breeds, so many animals will not fit this general description and final selection decisions should be made based on an individual's performance measures (EPD). These data can serve as a guide for commercial beef producers in deciding which breeds to use in crossbreeding programs allowing comparisons of strengths and weaknesses in various traits.

Table 1 Footnotes

* Sire Breed; Hereford-Angus on dam side. Differences in ★'s does not imply statistical differences!

[1]Breeds with more ★'s indicates greater weight for this trait (★ = lighter weight, ★★★★★ = heavier weight) at the same age

[2]Not adjusted for Body Condition Score

[3]Breeds with more ★'s indicates higher marbling score (★ = lighter marbling, ★★★★★ = heavier marbling) when harvested at the same age

[4]Breeds with more ★'s indicates greater ribeye area (★ = smaller ribeye, ★★★★★ = larger ribeye) when harvested at the same age

[5]Breeds with more ★'s indicates greater fat thickness at the 12th rib (★= less fat, ★★★★★ = more fat) when harvested at the same age

[6]Breeds with more ★'s indicates more lean compared to fat based on calculated yield grade (★ = less lean compared to fat, ★★★★★ = more lean compared to fat) when harvested at the same age; yield grade calculation assumes equal kidney, pelvic & heart fat

[7]Breeds with more ★'s indicates higher cow body condition scores (★ = lower condition, ★★★★★ = higher condition) at the same stage of production and same parity

[8]Breeds with more ★'s indicates a higher index value (better feed efficiency);★ = less efficient, ★★★★★ = more efficient on a high concentrate finishing diet

Table 2 Footnotes

*Sire Breed; Hereford-Angus on dam side. Missing values means the breed was not represented in that study

[1]Values are a deviation from an Angus base

[2]Yield grade calculated assuming equal kidney, pelvic and heart fat. Lower values means better lean to fat ratio

[3]BCS = Body Condition Score

[4] Feed Efficiency (FE) index was an unrestricted index using on-test ADFI and on-test ADG based of steers on a high concentrate finishing diet where higher values means better efficiency (Gain:Feed)

Sources:

- Birth, weaning, yearling and carcass weight, maternal milk, marbling, ribeye area, fat, carcass weight (Kuehn and Thallman, BIF 2022)
- Mature weight and body condition score (Ribeiro, A.M.F., et al. Genetic parameters, heterosis, and breed effects for body condition score and mature cow weight in beef cattle. Journal of Animal Science. Volume 100, Issue 2. February 2022. skac017 https://doi.org/10.1093/jas/skac017)
- Feed efficiency index (Retallick, K. J., et al. Genetic variance and covariance and breed differences for feed intake and average daily gain to improve feed efficiency in growing cattle. Journal of Animal Science. Volume 95, Issue 4. April 2017. https://doi.org/10.2527/jas.2016.1260)