

Belgian Blue crosses in the Germplasm Evaluation Program at the U.S. Meat Animal Research Center

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BREED DIFFERENCES

an important
genetic resource

SYSTEMATIC CROSSBREEDING OR COMPOSITE POPULATIONS

Use:

Heterosis
Breed differences

TO MATCH GENETIC POTENTIAL WITH:
Market preferences
Feed resources
Climatic environment

SIRE BREEDS USED TO PRODUCE F₁ CROSSES WITH ANGUS AND HEREFORD DAMS IN THE GERMLASM EVALUATION PROGRAM AT MARC^a

Cycle I 70-72	Cycle II 73-74	Cycle III 75-76	Cycle IV 86-90	Cycle V 92-94	Cycle VI 97-98	Cycle VII 99-00	Cycle VIII 01-02
Hereford Angus Jersey S. Devon Limousin Simmental Charolais	Hereford Angus Red Poll Braunvieh Gelbvieh Maine Anj. Chianina	Hereford Angus Brahman Sahiwal Pinzgauer Tarentaise	Hereford Angus Longhorn Salers Galloway Belg. Blue Brahman Shorthorn Piedmontese Charolais Gelbvieh Pinzgauer	Hereford Angus Tuli Boran Belg. Blue Brahman Piedmontese	Hereford Angus Wagyu Norweg. Red Sw. Red&Wh. Friesian	Hereford Angus Red Angus Limousin Charolais Simmental Gelbvieh	Hereford Angus Beefmaster Brahman Bonesmara Romoisnuano

^a Sire breeds mated to Angus and Hereford females, Composite MARC III (1/4 Angus, Hereford, Red Poll and Pinzgauer) cows were also included in Cycles V, VI, and VII.

Belgian Blue Sires Used in GPE Program at the U. S. Meat Animal Research Center (no. progeny produced 1992-1994)

Gaillard (23)	Fenton Fiesta (23)
Mythom Fontan ET (22)	Fenton Formosa (17)
Highgrove Cullard SRI IV (30)	Saphire Conrad (22)
Wicketthorn Mulrone (19)	Mr. Roger Mills (18)
Highgrove Sebastian (25)	TOF Debeemont Courage (18)
Ninebark King O'Lean (14)	TOF Degroynne Ingenieur (17)
Dulean Simon (15)	Wellington TG Steel Blue (19)
Stoneridge Topgun (22)	Highgrove J-LB Motolko (16)
Bio Raza Prince (14)	JBB Myers Mystic ZL (22)
Santos El Rey Azul (24)	Badlands Louie (24)
Bio Raza Teja Octavo (15)	Lawns Globe Trotter (15)
Bio Raza Duke (27)	Highgrove Carl (17)
Greystone Foreman (14)	

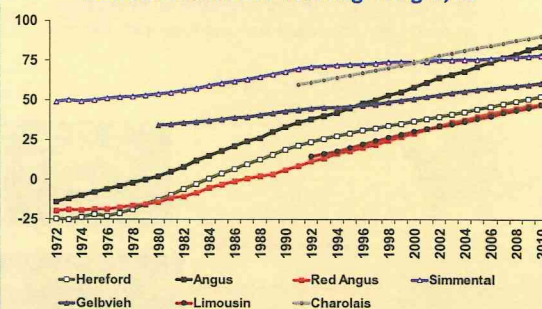
BREED GROUP MEANS FOR PREWEANING TRAITS OF PIEDMONTESE, BELGIAN BLUE AND SEVEN MOST PROMINENT SIRE BREEDS IN THE GPE PROGRAM

Sire breed of calf	No. calves born	Gestation length days	Calvings unassist. %	Calv. diff. score	Birth wt. lb.	Surv. to wn. %	200-d wn. wt., lb.
Hereford	190	284.3	95.6	1.24	90.4	96.2	524
Angus	189	281.6	99.6	1.01	84.0	96.7	533
Red Angus	206	282.1	99.1	1.06	84.5	96.7	526
Simmental	201	285.2	97.7	1.10	92.2	96.7	553
Gelbvieh	209	284.4	97.8	1.10	88.7	97.1	534
Limousin	200	286.2	97.6	1.13	89.5	96.9	519
Charolais	199	283.0	92.8	1.40	93.7	97.1	540
Piedmontese	144	287.8	95.0	1.28	87.4	98.3	520
Belgian Blue	469	283.0	92.1	1.39	87.5	95.4	525
LSD.05		1.6	3.9	.21	3.4	4.0	15

MEANS FOR GROWTH AND CARCASS TRAITS OF PIEDMONTÉSE, BELGIAN BLUE AND SEVEN PROMINENT SIRE BREEDS IN THE GPE PROGRAM

Sire Breed	N	ADG lb/d	Final Wt lb	Carc. wt lb	Dress. %	Marb. score	USDA Choice %	Fat thick in	Ribeye area sq in
Hereford	97	3.23	1322	803	60.5	526	65.4	.50	12.32
Angus	98	3.32	1365	836	61.1	584	87.6	.58	12.84
Red Angus	93	3.26	1333	811	60.7	590	89.9	.53	12.14
Simmental	92	3.26	1362	829	60.8	527	65.7	.37	13.57
Gelbvieh	90	3.12	1312	800	61.0	506	57.7	.35	13.41
Limousin	84	3.12	1285	795	61.8	504	56.9	.37	13.94
Charolais	95	3.21	1348	836	61.3	517	61.9	.34	13.74
Piedmontese	35	2.91	1248	786	62.7	489	51.8	.30	14.12
Belgian Blue	144	3.00	1318	828	62.6	481	48.8	.33	14.31
LSD<.05		.13	44	27	.7	29	12.0	.08	.55

Genetic Trends for Yearling Weight, lb



Adapted from Spring 2012 Genetic Trends from Breed Association and 2012 AB-EPD factors (Kuehn et al., 2012)

MEANS FOR RETAIL PRODUCT, FAT TRIM AND BONE YIELDS AND WEIGHTS FOR PIEDMONTÉSE, BELGIAN BLUE AND SEVEN MOST PROMINENT SIRE BREEDS IN THE GPE PROGRAM

Sire Breed	No.	Retail Product		Fat trim		Bone	
		%	lb	%	lb	%	lb
Hereford	86	60.7	480	26.0	213	14.3	113
Angus	83	59.2	488	27.7	235	13.7	113
Red Angus	81	59.1	474	27.6	226	13.8	111
Simmental	80	63.0	522	23.6	197	14.3	119
Gelbvieh	81	63.8	509	22.7	182	14.6	116
Limousin	73	63.7	504	23.5	188	14.1	111
Charolais	85	63.5	523	22.9	190	14.5	119
Piedmontese	35	69.0	517	18.0	156	14.4	105
Belgian Blue	143	67.3	541	19.1	169	15.0	117
LSD<.05		1.6	17	1.7	18	.5	5

MEANS FOR WARNER-BRATZLER SHEAR FORCE AND SENSORY CHARACTERISTICS OF RIB STEAKS FOR PIEDMONTÉSE, BELGIAN BLUE AND SEVEN PROMINENT SIRE BREEDS IN THE GPE PROGRAM

Sire Breed	No.	WB Shear force lb	Sensory Panel*		
			Tenderness score	Flavor score	Juiciness score
Hereford	86	9.1	5.63	4.91	5.32
Angus	83	8.9	5.77	4.93	5.39
Red Angus	82	9.2	5.69	4.94	5.38
Simmental	80	9.5	5.63	4.85	5.28
Gelbvieh	81	10.0	5.32	4.83	5.21
Limousin	73	9.5	5.65	4.88	5.27
Charolais	85	9.6	5.47	4.87	5.21
Piedmontese	35	9.4	5.49	4.84	5.10
Belgian Blue	143	10.0	5.30	4.85	5.10
LSD<.05		1.3	.40	.14	.17

*Sensory scores: 1 = extremely tough, bland or dry through 8 = extremely tender, intense or juicy.

Effects of Belgian Blue Mh allele and Piedmontese Mh allele are similar (Casas et al., 1998).

- Half sib families by a Belgian Blue X MARC III (n = 246) or a Piedmontese X Angus sire (n = 209) were compared.
- Effects of the Mh allele from Belgian Blue versus Piedmontese origin did not differ significantly for birth weight, retail product yield, rib eye area yield grade, marbling, fat thickness, estimated kidney, pelvic and heart fat,

Effects of Myostatin (Mh) allele in Piedmontese

F1 Piedmontese X Hereford and Piedmontese X Angus cows were mated to Hereford, Angus, Piedmontese, or F1 Piedmontese X Hereford of Piedmontese X Angus sires to produce reciprocal backcross and F2 progeny.

Objective: Determine effects of 0, 1, or 2 copies of Mh allele in offspring with 25, 50 or 75% Piedmontese inheritance.

Number of Calves				
Prop. Pied.	Number Mh alleles			
	0	1	2	
.25	83	65	--	
.50	21	44	12	
.75	--	50	26	

Casas et al. 1999



Effects of Myostatin (Mh) allele on calving difficulty

We observed significant calving difficulty in Piedmontese sired backcross and F2 calves carrying one (or two) copies of the Mh allele with dams calving at 2 or 3 years of age.



Calving difficulty, % (Casas et al. 1999)

Prop.	Mh alleles		
	0	1	2
Pied.			
.25	3 ± 3	10 ±	--
.50	4 ± 6	8 ± 4	23 ± 8
.75	--	4 ± 4	27 ± 5

However, we did not observe increased calving difficulty in Piedmontese sired calves carrying 0 or 1 copies of the Mh allele out of Hereford and Angus dams calving at 4 years of age or older.

Effect of Inactive Myostatin (Mh) Allele and Percentage Piedmontese on Retail Product Yield (number of animals, steers and heifers)

Percentage Piedmontese	Mh Alleles		
	0	1	2
0	64.1 (90)	-	-
25	64.1 (60)	70.4 (58)	-
50	65.7 (23)	71.2 (60)	85.1 (15)
75	-	72.6 (64)	84.9 (25)
	64.7 (173)	71.5 (182)	85.0 (40)

Wheeler et al. (2001)

Effect of Myostatin Genotype and Muscle on Sensory Panel Traits

Sensory trait and muscle	Myostatin Genotype		
	++	mh/+	mh/mh
Tenderness			
Longissimus (ribeye)	6.3 ± .06 ^{cd}	7.0 ± .06 ^a	7.1 ± .13 ^a
Gluteus medius (t. sirloin)	6.0 ± .07 ^e	6.5 ± .07 ^{bc}	6.7 ± .15 ^b
Semimembranosus (eye rd.)	5.5 ± .07 ^g	5.8 ± .07 ^{ef}	6.0 ± .15 ^{de}
Biceps femorus (b. round)	5.1 ± .06 ^h	5.6 ± .06 ^{fa}	6.3 ± .13 ^{bcd}

Wheeler et al. (2001)

abcdefghi Means lacking a common superscript differ (P < .05).

MEANS FOR EFFICIENCY OF LIVE WEIGHT AND RETAIL PRODUCT GAIN OF PIEDMONTSE, BELGIAN BLUE AND SEVEN PROMINENT SIRE BREEDS IN THE GPE PROGRAM (time endpoint - 445 days of age)

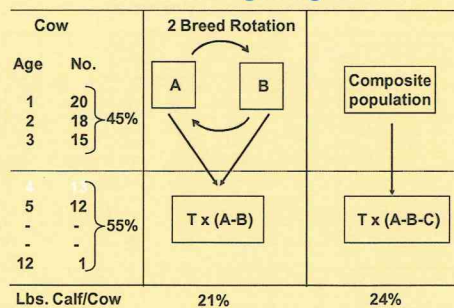
Sire Breed	Live wt gain per Mcal lb/Mcal	Dressing percent %	Retail Prod yield %	Retail Prod per Mcal g/Mcal
Hereford	0.1306 ^a	60.5 ^d	60.7 ^c	0.0480 ^c
Angus	0.1248 ^b	61.1 ^{bcd}	59.2 ^c	0.0448 ^d
Red Angus	0.1237 ^{ab}	60.7 ^{cd}	59.1 ^c	0.0440 ^d
Simmental	0.1265 ^{ab}	60.8 ^{cd}	63.0 ^b	0.0485 ^c
Gelbvieh	0.1221 ^{ab}	61.0 ^{bcd}	63.8 ^b	0.0475 ^{cd}
Limousin	0.1213 ^b	61.8 ^{bc}	63.7 ^b	0.0501 ^b
Charolais	0.1202 ^b	61.3 ^{bc}	63.5 ^b	0.0468 ^{cd}
Piedmontese	0.1213 ^{ab}	62.7 ^a	69.0 ^a	0.0522 ^{ab}
Belgian Blue	0.1217 ^{ab}	62.6 ^a	67.3 ^a	0.0537 ^a
LSD <.05	0.0081	0.8	1.6	~0.0035

CONCLUSION

Piedmontese or Belgian Blue are excellent candidates as terminal sire breeds provided producers are compensated for carcass and meat value.

Special marketing programs for "lean-tender" beef are essential for realization of their potential.

Terminal Sire Crossbreeding Programs



Conclusions

Belgian Blue and Piedmontese are excellent candidates as terminal sire breeds provided producers are compensated for carcass and meat value.

Continued development of special marketing programs for "lean-tender" beef are clearly justified to realize the potential of Belgian Blue or Piedmontese sired progeny.

Appendix Table

APPENDIX TABLE - BREED GROUP MEANS FOR REPRODUCTION AND MATERNAL TRAITS (Cycle V, GPE Program)

Sire breed of female	No.	Age at puberty, days	2-years of age			3 to 7 years of age		
			Calf crop wnd, %	per calf exposed lb	per cow exposed lb	Calf crop wnd, %	per calf exposed lb	per cow exposed lb
Hereford	152	355	73.8	419	300	88.7	474	422
Angus	130	351	74.4	437	313	86.3	493	426
Avg.	282	353	74.1	428	307	87.5	483	424
Brahman								
Original	82	429	54.3	456	238	85.9	511	440
Current	208	423	69.6	476	319	82.7	521	430
Avg.	244	426	62.0	466	279	83.2	516	435
Boran	206	396	83.3	444	357	86.2	488	421
Tuli	244	371	74.6	413	296	84.1	471	397
Piedmont.	75	348	75.3	441	321	85.3	476	404
Belg. Blue	237	348	71.0	436	300	79.0	502	398
LSD.05		13	13.9	18	62	6.7	14	36