Open Access

Archives Animal Breeding

Supplement of

A combined genotype of three SNPs in the bovine *PPARD* gene is related to growth performance in Chinese cattle

Jieping Huang et al.

Correspondence to: Yun Ma (mayun_666@126.com)

Table S1. Details of primers used for RT-PCR and SNP detection in bovine *PPARD* gene.

Name	Primer sequence (5'-3')	Size (bp)	Tm (℃)	Used for
Bovine-TUBAIA	F:GGAGGTTCGCACTGGCAC R:CGCCTTGCCAATGGTGTAG	107	54	RT-PCR for TUBAIA
Bovine-β-actin	F:CTGGGCGTAATGGTGGGC R:CTGATGCCGTGCTCAATGG	112	54	RT-PCR for β-actin
PPARD-mRNA	F:GTGATCCACGACATCGAGACG R:GCACTGGCAGCGGTAGAAG	120	54	RT-PCR for PPARD
PPARB-P1	F:TCCTGTCTTCCCTTTCGTCC R:GGAGACAACTCGCCCAAGAT	427	59	(nt71361-71787) Partial intron 1 and 2; exon 2
PPARB-P2	F:GAGACTGAACCTCGGAAAGG R:TTCGCAGTGGATCTGGTCT	582	56	(nt79690-80271) Partial intron 2 and 3; exon 3
PPARB-P3	F:ATTGTTTTACTTTCCTTCTGCCTCT R:GCTTTTCACACCTTGTCGGG	645	60	(nt80758-81402) Partial intron 3 and 4; exon 4
PPARB-P4	F:TAGACTCTGTGAACAAGATAGCCA R:TGGCAGCGGTAGAAGACG	670	57	(nt82121-82790) Partial intron 4 and 5; exon 5
PPARB-P5	F:CCACACGGCGGTGAGTGTC R:ATTGATACGTCTCCTTTTCCTTCT	778	62	(nt82491-83268) Partial intron 5 and 6; exon 6
PPARB-P6	F:CTGCCCATAGCCTTGTTAGT R:GAGCCAGAAGCCGTGAGT	554	55	(nt83818-84361) Partial intron 6 and exon 7
PPARB-P7	F:TCATTTCACAAAGTGGGGGG R:CAATGTCTTTTCTTGTGCAGCAG	564	59	nt(-2146)-(-1583) Partial promoter region
PPARB-P8	F:TACTGAGACCATAGGCCACAATT R:CTGCCGAACTACAGTCCGTG	601	61	nt(-1653)-(-1053) Partial promoter region
PPARB-P9	F:CCCCATTTACAGGGCAAGTATATT R:CCTGTTCATCGCCAATACCC	624	58	nt(-1186)-(-563) Partial promoter region

Table S2. Genetic characteristics of three SNPs detected in this study.

SNPs	Breeds	Sample	Genotype frequencies			Allele frequency		HWE-P value*	PIC	H_e	Ne
SNP 1			**GG**	**GA**	**AA**	**G**	**A**				
	NY	139	0.043	0.942	0.015	0.043	0.942	**106.582****	0.375	0.500	1.998
	JX	141	0.454	0.518	0.028	0.454	0.518	**8.861***	0.325	0.410	1.694
	LX	114	0.421	0.579	0.000	0.421	0.579	**17.384****	0.327	0.411	1.699
	QC	30	0.700	0.300	0.000	0.700	0.300	0.141	0.223	0.255	1.342
	BH	30	0.567	0.333	0.100	0.567	0.333	0.201	0.315	0.391	1.642
	GY	60	0.067	0.933	0.000	0.067	0.933	**43.339****	0.374	0.498	1.991
SNP 2			**AA**	**GA**	**GG**	**A**	**G**				
	NY	139	0.000	0.317	0.683	0.158	0.842	3.772	0.251	0.266	1.363
	JX	141	0.000	0.539	0.461	0.270	0.730	**17.719****	0.316	0.394	1.650
	LX	114	0.000	0.430	0.570	0.215	0.785	**7.252***	0.281	0.337	1.509
	QC	30	0.000	0.567	0.433	0.283	0.717	3.278	0.324	0.406	1.684
	BH	30	0.000	0.700	0.300	0.350	0.650	**6.976***	0.352	0.455	1.835
	GY	60	0.000	0.133	0.867	0.067	0.933	0.205	0.117	0.124	1.142
SNP 3			**TT**	**TC**	**CC**	**T**	**C**				
	NY	139	0.151	0.612	0.237	0.457	0.543	**7.495***	0.373	0.496	1.985
	JX	141	0.291	0.667	0.042	0.624	0.376	**24.977****	0.359	0.469	1.884
	LX	114	0.281	0.631	0.088	0.597	0.403	**11.099****	0.366	0.481	1.928
	QC	30	0.500	0.367	0.133	0.683	0.317	0.267	0.339	0.433	1.763
	BH	30	0.700	0.267	0.033	0.833	0.167	0.142	0.239	0.278	1.385
	GY	60	0.033	0.450	0.517	0.258	0.742	1.169	0.310	0.383	1.621

Not: SNP = Single Nucleotide Polymorphism; HWE = Hardy-Weinberg equilibrium; PIC = polymorphism information content; H_e = heterozygosity; N_e = effective allele numbers. JX = Jiaxian; LX = Luxi; NY = Nanyang; QC = Qinchuan; BH = Bohai; GY = Gaoyuan. $\chi^2_{0.05} = 5.99$, $\chi^2_{0.01} = 9.21$, * means the difference is significant at the 0.05 level. ** means the difference is significant at the 0.01 level. $\chi^2 > 5.99$ means deviating from Hardy-Weinberg equilibrium (HWE) with significant level. $\chi^2 > 9.21$ means deviating from HWE with highly significant level. PIC > 0.5 means high diversity, 0.25 <PIC < 0.5 means moderate diversity, PIC < 0.25 means low diversity.

Table S3. Association analysis between SNPs loci of PPARD and growth traits in Henan cattle.

Age (month)	Growth trait	SNP 1			SNP 2		SNP 3		
		GG (24)	GA (147)	AA (2)	AG (85)	GG (88)	TT (37)	TC (108)	CC (28)
0	WB (kg)	27.921 ± 0.754[Bb]	30.219 ± 0.305[A]	33.750 ± 2.613[a]	29.107 ± 0.402[B]	30.747 ± 0.395[A]	28.608 ± 0.615[b]	30.269 ± 0.360[a]	30.439 ± 0.706[a]
6	BW (kg)	174.875 ± 4.884[a]	161.626 ± 1.974[b]	158.250 ± 16.920	169.741 ± 2.548[A]	157.324 ± 2.504[B]	162.730 ± 3.992	164.824 ± 2.336	158.946 ± 4.589
	BH (cm)	101.583 ± 2.482	99.925 ± 1.003	108.000 ± 8.596	98.235 ± 1.302[b]	102.193 ± 1.279[a]	95.324 ± 1.956[b]	101.185 ± 1.145[a]	103.143 ± 2.249[a]
	BL (cm)	108.792 ± 1.352	106.687 ± 0.546	110.500 ± 4.684	108.306 ± 0.709[a]	105.784 ± 0.697[b]	110.135 ± 1.063[A]	106.296 ± 0.622[B]	105.714 ± 1.222[B]
	HG (cm)	132.208 ± 2.060[a]	127.180 ± 0.832[b]	126.500 ± 7.135	129.035 ± 1.101	126.744 ± 1.082	129.176 ± 1.678	127.769 ± 0.982	126.536 ± 1.929
	HW (cm)	12.917 ± 0.872[Bb]	16.374 ± 0.352[A]	19.750 ± 3.021[a]	13.835 ± 0.426[B]	17.960 ± 0.419[A]	14.176 ± 0.692[C]	15.764 ± 0.405[B]	18.911 ± 0.796[A]
	ADG (kg)	0.816 ± 0.027[A]	0.726 ± 0.011[B]	0.715 ± 0.093	0.780 ± 0.014[A]	0.698 ± 0.014[B]	0.744 ± 0.022	0.745 ± 0.013	0.705 ± 0.025
12	BW (kg)	247.000 ± 5.190	239.929 ± 2.097	217.000 ± 17.980	240.141 ± 2.776	241.131 ± 2.729	240.784 ± 4.214	241.444 ± 2.467	237.375 ± 4.844
	BH (cm)	113.958 ± 0.775	113.391 ± 0.313	115.000 ± 2.684	113.329 ± 0.411	113.642 ± 0.404	113.203 ± 0.624	113.435 ± 0.365	114.071 ± 0.717
	BL (cm)	118.583 ± 1.046	116.952 ± 0.423	116.500 ± 3.622	117.306 ± 0.557	117.045 ± 0.548	118.892 ± 0.834[a]	116.583 ± 0.488[b]	117.179 ± 0.958
	HG (cm)	145.917 ± 1.483	143.194 ± 0.599	140.500 ± 5.137	145.129 ± 0.775	142.006 ± 0.761	147.243 ± 1.162[Aa]	142.514 ± 0.68[B]	142.607 ± 1.336[b]
	HW (cm)	15.958 ± 0.846[B]	18.840 ± 0.342[A]	21.000 ± 2.931	16.641 ± 0.419[B]	20.227 ± 0.412[A]	16.486 ± 0.666[C]	18.509 ± 0.390[B]	20.911 ± 0.766[A]
	ADG (kg)	0.401 ± 0.032	0.435 ± 0.013	0.326 ± 0.112	0.391 ± 0.017[B]	0.466 ± 0.016[A]	0.434 ± 0.026	0.426 ± 0.015	0.436 ± 0.030

18	BW (kg)	294.458 ± 6.357	305.020 ± 2.569	335.000 ± 22.022	301.047 ± 3.398	306.659 ± 3.339	303.703 ± 5.168	302.472 ± 3.025	309.679 ± 5.941
	BH (cm)	119.833 ± 0.697	120.724 ± 0.282	124.000 ± 2.416	119.894 ± 0.364^{B}	121.358 ± 0.358^{A}	120.541 ± 0.565	120.509 ± 0.331	121.268 ± 0.650
	BL (cm)	125.500 ± 1.084	127.371 ± 0.438	131.000 ± 3.754	127.206 ± 0.580	127.102 ± 0.570	127.351 ± 0.876	126.755 ± 0.513	128.429 ± 1.007
	HG (cm)	157.917 ± 1.649	159.412 ± 0.666	154.000 ± 5.711	158.865 ± 0.877	159.409 ± 0.862	159.892 ± 1.309	158.083 ± 0.766^{b}	162.232 ± 1.505^{a}
	HW (cm)	19.458 ± 0.792^{B}	21.946 ± 0.320^{A}	23.500 ± 2.743	20.341 ± 0.408^{B}	22.852 ± 0.401^{A}	19.824 ± 0.620^{c}	21.625 ± 0.363^{b}	23.964 ± 0.713^{a}
	ADG (kg)	0.264 ± 0.029^{B}	0.362 ± 0.012^{A}	0.656 ± 0.100^{C}	0.338 ± 0.016	0.364 ± 0.016	0.350 ± 0.024	0.339 ± 0.014^{b}	0.402 ± 0.028^{a}
24	BW (kg)	347.417 ± 8.677^{b}	367.500 ± 3.506^{a}	410.000 ± 30.059^{a}	358.612 ± 4.635^{b}	371.574 ± 4.556^{a}	363.405 ± 7.080	362.894 ± 4.144	376.500 ± 8.139
	BH (cm)	124.833 ± 0.788	126.133 ± 0.318	127.500 ± 2.729	125.212 ± 0.413^{b}	126.699 ± 0.406^{a}	125.473 ± 0.633	125.824 ± 0.370	127.179 ± 0.728
	BL (cm)	136.167 ± 1.307	136.486 ± 0.528	136.500 ± 4.529	137.165 ± 0.688	135.744 ± 0.677	136.838 ± 1.043	135.847 ± 0.611	138.214 ± 1.199
	HG (cm)	166.208 ± 1.664^{b}	170.724 ± 0.672^{a}	167.500 ± 5.763	168.941 ± 0.890	171.142 ± 0.875	168.919 ± 1.327^{B}	169.319 ± 0.777^{B}	174.429 ± 1.526^{A}
	HW (cm)	21.875 ± 0.791^{B}	24.524 ± 0.320^{A}	26.250 ± 2.741	23.047 ± 0.414^{B}	25.267 ± 0.407^{A}	22.676 ± 0.635^{Cc}	24.236 ± 0.372^{b}	25.929 ± 0.730^{Aa}
	ADG (kg)	0.294 ± 0.033	0.347 ± 0.013	0.417 ± 0.114	0.320 ± 0.017	0.361 ± 0.017	0.332 ± 0.027	0.336 ± 0.016	0.371 ± 0.031

Notes: capital letter means differ of the value at $P < 0.01$; lowercase letter means differ of the value at $P < 0.05$. WB = weight of birth; BW = body weight; BH = body height; BL = body length; HG = heart girth; HW = hip width; ADG = average daily gain.