Open Access
Asian Australas. J. Anim. Sci.
Vol. 27, No. 5 : 616-627 May 2014
http://dx.doi.org/10.5713/ajas.2013.13365
www.ajas.info
pISSN 1011-2367 eISSN 1976-5517

Empirical Selection of Informative Microsatellite Markers within Co-ancestry Pig Populations Is Required for Improving the Individual Assignment Efficiency

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- Supplementary Data –

Table S1. List of the microsatellite markers ranked by F_{ST}, H_E, K (allelic number), D-score based on the results from 14 populations (Approach 1) and also results obtained only from 6 populations of Lanyu and its derived populations (Approach 2, designated as within Lanyu)[1]

Approach 1												Approach 2 (within Lanyu)										
F_{ST}			K			H_E			Dscore			F_{ST}			K			H_E			Dscore		
Locus	F_{ST}	Rank	Locus	K	Rank	Locus	H_E	Rank	Locus	Score	Rank	Locus	F_{ST}	Rank	Locus	K	Rank	Locus	H_E	Rank	Locus	Score	Rank
S0215	0.5	1	S0005	29	1	S0005	0.89	1	S0068	0.56	1	SW911	0.54	1	**S0005**	14	1	**S0218**	0.76	1	S0226	0.39	1
S0225	0.5	2	S0227	18	2	S0068	0.87	2	S0355	0.44	2	**S0226**	0.44	2	**S0227**	10	2	**SW951**	0.74	2	S0227	0.32	2
S0228	0.48	3	S0068	15	3	SW857	0.85	3	S0005	0.43	3	**SW122**	0.43	3	**SW857**	9	3	**S0355**	0.7	3	SW122	0.3	3
S0355	0.48	4	S0218	15	4	S0228	0.85	4	S0228	0.42	4	**SW951**	0.41	4	**S0226**	8	4	**SW122**	0.7	4	S0068	0.29	4
S0227	0.45	5	SW122	14	5	S0226	0.85	5	SW857	0.39	5	**S0218**	0.39	5	**S0218**	7	5	**SW857**	0.7	5	SW857	0.28	5
S0068	0.45	6	S0226	14	6	S0002	0.84	6	S0226	0.36	6	**S0355**	0.38	6	**S0355**	7	6	**S0226**	0.7	6	SW911	0.23	6
S0002	0.44	7	S0355	13	7	SW122	0.83	7	S0002	0.33	7	S0215	0.38	7	**SW122**	7	7	**S0225**	0.69	7	S0218	0.22	7
S0155	0.43	8	S0002	12	8	S0355	0.83	8	SW122	0.3	8	S0002	0.37	8	**SW951**	7	8	**S0005**	0.66	8	S0225	0.18	8
SW911	0.41	9	S0228	12	9	IGF1	0.81	9	S0218	0.29	9	S0227	0.37	9	**IGF1**	6	9	**S0386**	0.66	9	S0355	0.15	9
SW24	0.41	10	SW857	11	10	S0225	0.81	10	S0227	0.26	10	S0068	0.34	10	S0002	6	10	IGF1	0.66	10	SW951	0.13	10
S0386	0.4	11	IGF1	11	11	S0218	0.81	11	S0225	0.24	11	SW857	0.26	11	S0386	6	11	S0068	0.64	11	IGF1	0.11	11
S0218	0.39	12	SW72	11	12	SW951	0.8	12	SW951	0.24	12	S0386	0.26	12	S0068	5	12	S0227	0.64	12	S0002	0.11	12
SW951	0.38	13	S0225	11	13	SW72	0.78	13	SW911	0.22	13	IGF1	0.24	13	S0228	5	13	SW911	0.64	13	S0228	0.07	13
S0226	0.37	14	S0155	10	14	S0227	0.77	14	SW24	0.2	14	SW72	0.23	14	SW72	5	14	SW72	0.64	14	S0005	0.06	14
IGF1	0.35	15	SW24	10	15	S0155	0.76	15	S0386	0.2	15	S0228	0.22	15	S0225	5	15	S0228	0.62	15	SW24	0	15
SW857	0.32	16	S0386	10	16	SW24	0.76	16	S0155	0.19	16	S0005	0.21	16	SW911	4	16	S0002	0.61	16	SW72	0	16
SW72	0.31	17	S0215	9	17	SW911	0.73	17	SW72	0.15	17	S0225	0.15	17	S0215	4	17	S0155	0.59	17	S0155	0	17
SW122	0.3	18	SW911	7	18	S0386	0.7	18	IGF1	0.13	18	S0155	0.11	18	S0155	3	18	S0215	0.46	18	S0215	0	18
S0005	0.29	19	SW951	7	19	S0215	0.62	19	S0215	0.11	19	SW24	0.06	19	SW24	3	19	SW24	0.18	19	S0386	0	19

[1] The markers contributing to overall high assignment accuracy are listed in bold.

Table S2. i) Error in assigning individuals to each population[1]

A		**Random ordering**																		
Population	N	SW857	IGF1	S0155	S0005	SW911	S0068	S0002	S0228	SW24	S0227	SW72	S0218	S0355	SW122	S0225	S0226	SW951	S0215	S0386
Lanyu (TAPS)	39	37	37	18	5	5		1	1	1	1	1	1							
Spotty Lanyu	18	18	18	12	5	2	3	2	1	1	2	2	2	2	2	2	1	1	1	1
Binlang Lanyu	21	21	5	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mitsae Lanyu	17	17	9	2	1	1		1												
Lanyu (NTU)	5	3	3	1																
Lee-Sung	32	6	5	6	3	1	2	1	1	1	1	1	1	1	1	1				
Landrace	30	7	6	2	3	1	1	1	2	1										
Yorkshire	30	16	4	6	4	3	1						1							
Berkshire	29	29	6	5	1	1	1													
Duroc	30	18	18	4	3															
TLRI Black pig NO.1	21	21	13	8	3	1														
Taoyuan	30	12	3																	
Meishan	29	1	1																	
KHAPS Black pig	21	20	7	6	1	2														

B		**Rank of F_{ST} in approach 1**																		
Population	N	S0215	S0225	S0228	S0355	S0227	S0068	S0002	S0155	SW911	SW24	S0386	S0218	SW951	S0226	IGF1	SW857	SW72	SW122	S0005
Lanyu (TAPS)	39	39	13	14	4	4	4													
Spotty Lanyu	18	8	9	8	4	4	4	4	3	3	4	4	4	2	2	2	2	2	2	1
Binlang Lanyu	21	21	6	4	3	4	3	2	2	1	2	2	3	1	1	1	1	1	1	1
Mitsae Lanyu	17	17	5	2	2	1														
Lanyu (NTU)	5	5	3	3	1	1	1													
Lee-Sung	32	4	13	11	5	1		1	1					1						
Landrace	30			2																
Yorkshire	30	15	15	6																
Berkshire	29	29	29	4	3	3														
Duroc	30	30	7	1																
TLRI Black pig NO.1	21	14	5	3																
Taoyuan	30																			
Meishan	29	13	1																	
KHAPS Black pig	21	21	8	1																

C		**Rank of H_E in approach 1**																		
Population	N	S0005	S0068	SW857	S0228	S0226	S0002	SW122	S0355	IGF1	S0225	S0218	SW951	SW72	S0227	S0155	SW24	SW911	S0386	S0215
Lanyu (TAPS)	39	11	5	5	3	1														
Spotty Lanyu	18	8		2	2	6	5	2	3	3	2	1						1	1	1
Binlang Lanyu	21	18	16	8	6	1		1	1	1	1	1	1	1	1	1	1	1	1	1
Mitsae Lanyu	17	8	2	1	1	1														
Lanyu (NTU)	5		1	1	1															
Lee-Sung	32	22	7	2	2															
Landrace	30	9	4			1														
Yorkshire	30	5			1	1		1												
Berkshire	29	23	1																	
Duroc	30	2																		
TLRI Black pig NO.1	21	9	6	2																
Taoyuan	30	10																		
Meishan	29	1																		
KHAPS Black pig	21	9	6	4	2															

D		**Rank of K in approach 1**																		
Population	N	S0005	S0227	S0068	S0218	SW122	S0226	S0355	S0002	S0228	SW857	IGF1	SW72	S0225	S0155	SW24	S0386	S0215	SW911	SW951
Lanyu (TAPS)	39	11	11	4	2	2			1											
Spotty Lanyu	18	8	7	5	5	4	3	2	2	2	1	2	2	2	1	2	1	1	1	1
Binlang Lanyu	21	18	16	6	6	5	2	2	2	2	2	1	2	1	1	1	1	1	1	1
Mitsae Lanyu	17	8	6																	
Lanyu (NTU)	5				1															
Lee-Sung	32	22	4	4	3	1	1													
Landrace	30	9	6	5	2	2	1													
Yorkshire	30	5	4	1			1													
Berkshire	29	23	7	3																
Duroc	30	2	1	1																
TLRI Black pig NO.1	21	9																		
Taoyuan	30	10	1																	
Meishan	29	1	1																	
KHAPS Black pig	21	9	4	2	1															

Table S2. ii) Error in assigning individuals to each population[1] (Continued)

E		**Rank of F_{ST} in approach 2**																		
Population	N	SW911	S0226	SW122	SW951	S0218	S0355	S0215	S0002	S0227	S0068	SW857	S0386	IGF1	SW72	S0228	S0005	S0225	S0155	SW24
Lanyu (TAPS)	39	37	5	4	2	1														
Spotty Lanyu	18	11	6	3	2	1	1	1	1	1	1	1	2	1	2	2	1	1	1	1
Binlang Lanyu	21	13	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mitsae Lanyu	17																			
Lanyu (NTU)	5	5																		
Lee-Sung	32	1	1	2	1		1	1	1	1	1									
Landrace	30	17	11	3	5	5	1													
Yorkshire	30	8	11	1	2	2														
Berkshire	29	9		2	2															
Duroc	30	23	15	3	1	1														
TLRI Black pig NO.1	21	17	9																	
Taoyuan	30	26																		
Meishan	29	8	6	1	1															
KHAPS Black pig	21	10	3	2																

F		**Rank of H_E in approach 2**																		
Population	N	S0218	SW951	S0355	SW122	SW857	S0226	S0225	S0005	S0386	IGF1	S0068	S0227	SW911	SW72	S0228	S0002	S0155	S0215	SW24
Lanyu (TAPS)	39	18	16	5	4	1														
Spotty Lanyu	18	13	6	2	3	1			1						1	1	1	1	1	1
Binlang Lanyu	21	6	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mitsae Lanyu	17	8	5		1															
Lanyu (NTU)	5	5	2	1	1	1														
Lee-Sung	32	7	4	1	2	2														
Landrace	30	12	18	8	4	1	1	1	1											
Yorkshire	30	21	15	6	3	1	1	1												
Berkshire	29	20	13	2				1												
Duroc	30	25	14	2																
TLRI Black pig NO.1	21	20	10	4	2	1														
Taoyuan	30	3																		
Meishan	29	7		1																
KHAPS Black pig	21	9	9	2	1															

G		**Rank of K in approach 2**																		
Population	N	S0005	S0227	SW857	S0226	S0218	S0355	SW122	SW951	IGF1	S0002	S0386	S0068	S0228	SW72	S0225	SW911	S0215	S0155	SW24
Lanyu (TAPS)	39	11	1	1																
Spotty Lanyu	18	8	8	7	3	4	3									1	1	1	1	1
Binlang Lanyu	21	18	12	5	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mitsae Lanyu	17	8	2																	
Lanyu (NTU)	5																			
Lee-Sung	32	22	10	1																
Landrace	30	9	2	3	3	1	1	1												
Yorkshire	30	5	1	1	1			1												
Berkshire	29	23	2	1	1	1	1	1	1											
Duroc	30	2																		
TLRI Black pig NO.1	21	9	7	2	1															
Taoyuan	30	10																		
Meishan	29	1	1																	
KHAPS Black pig	21	9	5	2	1															

[1] Markers were selected and ranked using two approaches. Approach 1 ranking by the highest F_{ST} (B), H_E (C), K (allelic numbers, D), and random ordering (A) from 14 populations; Approach 2 (within Lanyu), the markers were selected and ranked from statistics within 6 Lanyu and its derived lines and breeds; ranking is from highest F_{ST} (E), H_E (F), and K (G). N indicates the Number of individuals.

Table S3. Percentage of all samples assigned and excluded from each reference populations based on the 19 microsatellite markers[1]

	Lanyu (TAPS)	Spotty Lanyu	Binlang Lanyu	Mitsai Lanyu	Lanyu (NTU)	Lee-Sung	Landrace	Yorkshire	Berkshire	Duroc	TLRI Black pig NO.1	Taoyuan	Meishan	KHAPS Black pig
Lanyu (TAPS)														
Assignment	100	-	-	-	-	-	-	-	-	-	-	-	-	-
Exclusion	2.56	100	100	100	100	100	100	100	100	100	100	100	100	100
Spotty Lanyu														
Assignment	5.56	94.44	-	-	-	-	-	-	-	-	-	-	-	-
Exclusion	100	5.56	100	100	100	100	100	100	100	100	100	100	100	100
Binlang Lanyu														
Assignment	-	4.76	95.24	-	-	-	-	-	-	-	-	-	-	-
Exclusion	100	95.24	4.76	100	100	100	100	100	100	100	100	100	100	100
Mitsai Lanyu														
Assignment	-	-	-	100	-	-	-	-	-	-	-	-	-	-
Exclusion	100	100	100	5.88	100	100	100	100	100	100	100	100	100	100
Lanyu (NTU)														
Assignment	-	-	-	-	100	-	-	-	-	-	-	-	-	-
Exclusion	100	100	100	100	0	100	100	100	100	100	100	100	100	100
Lee-Sung														
Assignment	-	-	-	-	-	100	-	-	-	-	-	-	-	-
Exclusion	100	100	100	100	100	0	100	100	100	100	100	100	100	100
Landrace														
Assignment	-	-	-	-	-	-	100	-	-	-	-	-	-	-
Exclusion	100	100	100	100	100	100	0	100	100	100	100	100	100	100
Yorkshire														
Assignment	-	-	-	-	-	-	-	100	-	-	-	-	-	-
Exclusion	100	100	100	100	100	100	100	3.33	100	100	100	100	100	100
Berkshire														
Assignment	-	-	-	-	-	-	-	-	100	-	-	-	-	-
Exclusion	100	100	100	100	100	100	100	100	0	100	100	100	100	100
Duroc														
Assignment	-	-	-	-	-	-	-	-	-	100	-	-	-	-
Exclusion	100	100	100	100	100	100	100	100	100	0	100	100	100	100
TLRI Black pig NO.1														
Assignment	-	-	-	-	-	-	-	-	-	-	100	-	-	-
Exclusion	100	100	100	100	100	100	100	100	100	100	0	100	100	100
Taoyuan														
Assignment	-	-	-	-	-	-	-	-	-	-	-	100	-	-
Exclusion	100	100	100	100	100	100	100	100	100	100	100	0	100	100
Meishan														
Assignment	-	-	-	-	-	-	-	-	-	-	-	-	100	-
Exclusion	100	100	100	100	100	100	100	100	100	100	100	100	0	100
KHAPS Black pig														
Assignment	-	-	-	-	-	-	-	-	-	-	-	-	-	100
Exclusion	100	100	100	100	100	100	100	100	100	100	100	100	100	0

[1] Assignment testing with a threshold of 0.05 (Cornuet et al., 1999) was used and a confidence level of 0.05 in the exclusion tests.