

LAMPIRAN

Lampiran 1. Perhitungan Analisis Data

Sapi FH

Total sampel ter-digest = 200 sampel

Genotype AA = 20 sampel

Genotype AB = 125 sampel

Genotype BB = 55 sampel

A. Frekuensi Genotipe

$$X_{ii} = \frac{n_{ii}}{N}$$

Keterangan:

X_{ii} = frekuensi genotip ke-ii

n_{ii} = jumlah individu bergenotip ii

N = jumlah sampel

- Frekuensi genotip AA

$$X_{AA} = \frac{n_{AA}}{N}$$

$$X_{AA} = \frac{20}{200}$$

$$= 0,1$$

- Frekuensi genotip AB

$$X_{AB} = \frac{n_{AB}}{N}$$

$$X_{AB} = \frac{125}{200}$$

$$= 0,6$$

- Frekuensi genotip BB

$$X_{BB} = \frac{n_{BB}}{N}$$

$$X_{BB} = \frac{55}{200}$$

$$= 0,3$$

B. Frekuensi alel

$$x_i = \frac{(2n_{ii} + \sum_{i \neq j} n_{ij})}{2N}$$

Keterangan:

x_i = frekuensi alel ke-i;

x_{ii} = frekuensi genotipe ke-i;

n_{ii} = jumlah individu bergenotipe ii;

n_{ij} = jumlah individu bergenotipe ij; dan

N = jumlah total sampel.

- Frekuensi Alel A = $\frac{2 \times 20 + 125}{2 \times 200} = \frac{165}{400} = 0,4125$
- Frekuensi Alel B = $\frac{2 \times 55 + 125}{2 \times 200} = \frac{235}{400} = 0,5875$

C. Frekuensi Harapan Genotipe dan Alel

Genotype	Frekuensi genotipe	Nilai pengamatan (jumlah genotype individu)	
		Harapan	observasi
AA	0,1	$0,1 \times 200 = 20$	20
AB	0,6	$0,6 \times 200 = 120$	125
BB	0,3	$0,3 \times 200 = 60$	55

D. Keseimbangan Hardy-Weinberg

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Keterangan:

χ^2 = chi-kuadrat;

O = nilai pengamatan; dan

E = nilai harapan.

$$X^2 = \frac{(20 - 20)^2}{20} + \frac{(125 - 120)^2}{120} + \frac{(55 - 60)^2}{60}$$

$$X^2 = 0 + 0,2 + 0,4$$

$$X^2 = \mathbf{0,6}$$

E. Derajat Heterosigositas

$$H_0 = \sum_{i \neq j} \frac{n_{ij}}{N}$$

Keterangan:

H_0 = heterosigositas pengamatan;

N_{ij} = jumlah individu heterozigot pada lokus ke-i; dan

N = jumlah individu yang diamati.

- $H_0 = \frac{\text{Jumlah heterozigositas pengamatan}}{\text{jumlah sampel}}$
- = $\frac{125}{200}$
- = $\mathbf{0,625}$

Heterosigositas harapan (H_e)

$$H_e = 1 - \sum_{i=1}^q x_i^2$$

Keterangan:

H_e = heterosigositas harapan;

x_i = frekuensi alel ke-i ; dan

q = jumlah alel.

- $H_e = 1 - \sum_{i=1}^q X_i^2$
- = $1 - (0,4125^2 + 0,5875^2)$
- = $1 - (0,17015625 + 0,34515625)$
- = $1 - 0,5153125$
- = $\mathbf{0,485}$

F. PIC (polymorphic information content)

$$\begin{aligned} \text{PIC} &= 1 - \sum_{i=1}^q X_i^2 - \sum_{i=1}^n \sum_{j=i+1}^n 2p_i^2 p_j^2 \\ &= 0,485 - (2 \times 0,17015625 \times 0,34515625) \\ &= 0,485 - 0,11746 \\ &= \mathbf{0,3675} \end{aligned}$$

Sapi Sumbawa

Total sampel ter-digest = 72 sampel

Genotype AA = 0 sampel

Genotype AB = 72 sampel

Genotype BB = 0 sampel

A. Frekuensi Genotipe

$$x_{ii} = \frac{n_{ii}}{N}$$

- Frekuensi genotipe AA

$$X_{AA} = \frac{n_{AA}}{N}$$

$$X_{AA} = \frac{0}{72}$$

$$= 0$$

- Frekuensi genotipe AB

$$X_{AB} = \frac{n_{AB}}{N}$$

$$X_{AB} = \frac{72}{72}$$

$$= 1$$

- Frekuensi genotipe BB

$$X_{BB} = \frac{n_{BB}}{N}$$

$$X_{BB} = \frac{0}{72}$$

$$= 0$$

B. Frekuensi alel

$$x_i = \frac{(2n_{ii} + \sum_{i \neq j} n_{ij})}{2N}$$

Keterangan:

x_i = frekuensi alel ke-i;

x_{ii} = frekuensi genotipe ke-i;

n_{ii} = jumlah individu bergenotipe ii;

n_{ij} = jumlah individu bergenotipe ij; dan

N = jumlah total sampel.

- Frekuensi Relatif Alel A = $\frac{2 \times 0 + 72}{2 \times 72} = 0,5$

- Frekuensi Relatif Alel B = $\frac{2 \times 0 + 72}{2 \times 72} = 0,5$

C. Frekuensi Harapan genotype dan Alel

Genotype	Frekuensi genotype	Nilai pengamatan (jumlah genotype individu)	
		Harapan	observasi
AA	0	$0 \times 72 = 0$	0
AB	1	$1 \times 72 = 72$	72
BB	0	$0 \times 72 = 0$	0

D. Keseimbangan Hardy-Weinberg

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Keterangan:

χ^2 = chi-kuadrat;

O = nilai pengamatan; dan

E = nilai harapan.

$$\begin{aligned} X^2 &= \frac{(0 - 0)^2}{20} + \frac{(72 - 72)^2}{125} + \frac{(0 - 0)^2}{55} \\ X^2 &= 0 + 0 + 0 \\ X^2 &= \mathbf{0} \end{aligned}$$

E. Derajat Heterosigositas

Heterosigositas pengamatan

$$H_0 = \sum_{i \neq j} \frac{n_{ij}}{N}$$

Keterangan:

H0 = heterosigositas pengamatan;

Nij = jumlah individu heterozigot pada lokus ke-i; dan

N = jumlah individu yang diamati.

$$\begin{aligned} \bullet H_0 &= \frac{\text{Jumlah heterozigositas pengamatan}}{\text{jumlah sampel}} \\ &= \frac{72}{72} \\ &= \mathbf{1} \end{aligned}$$

Heterosigositas harapan

$$H_e = 1 - \sum_{i=1}^q x_i^2$$

Keterangan:

He = heterosigositas harapan;

xi = frekuensi alel ke-i ; dan

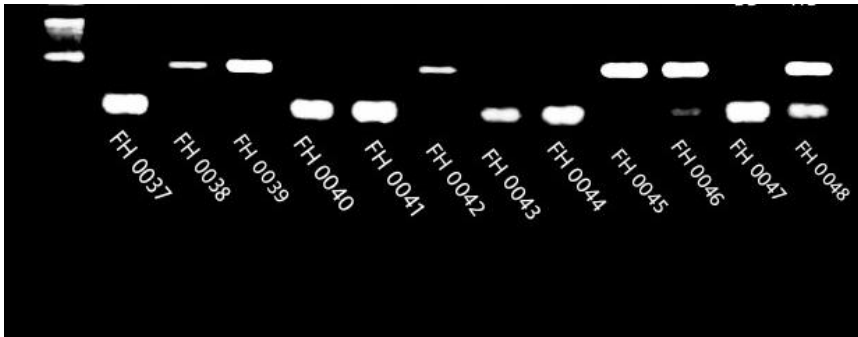
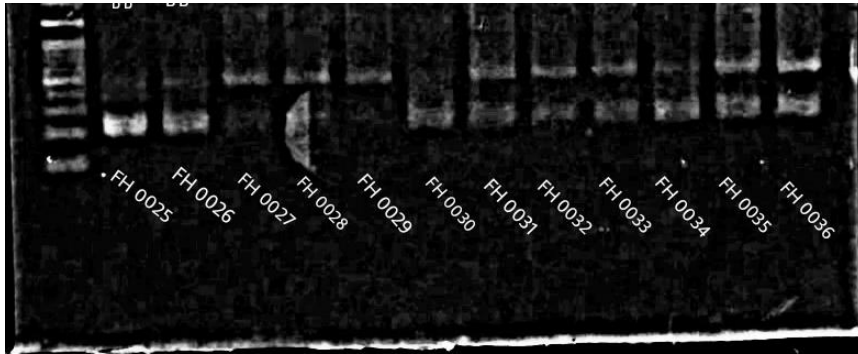
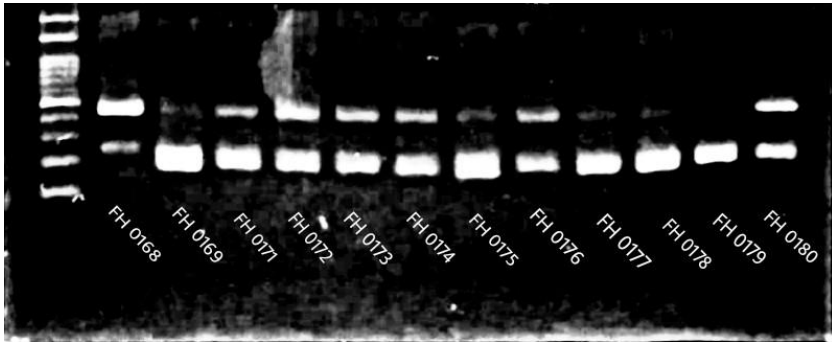
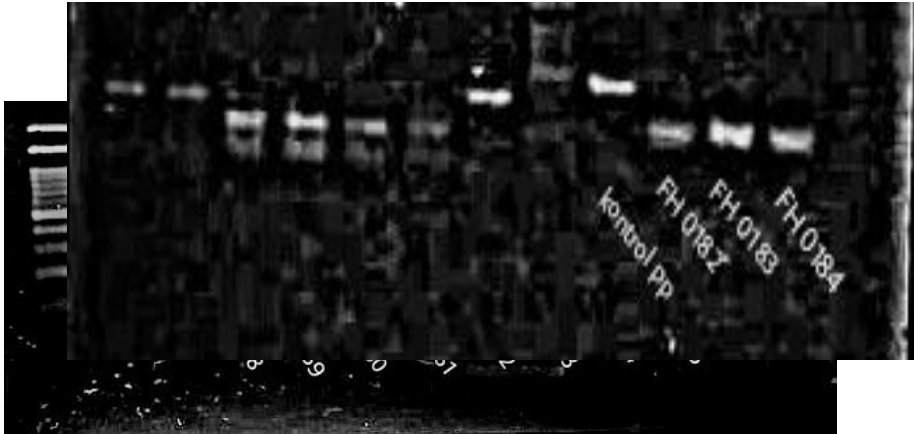
q = jumlah alel.

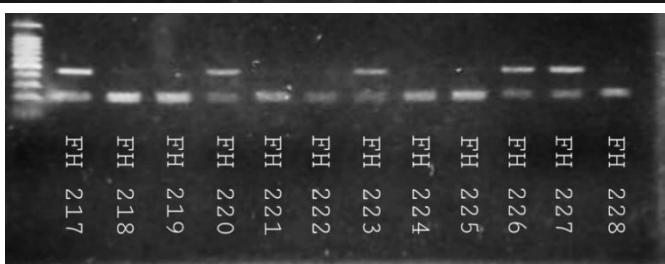
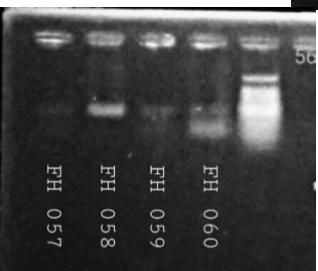
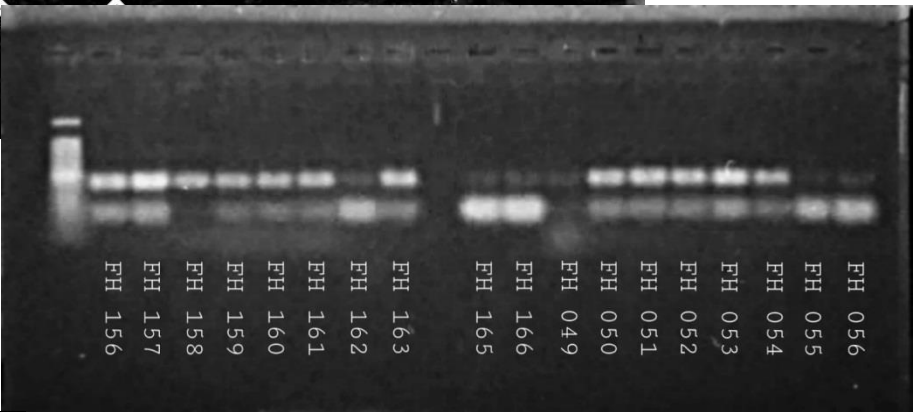
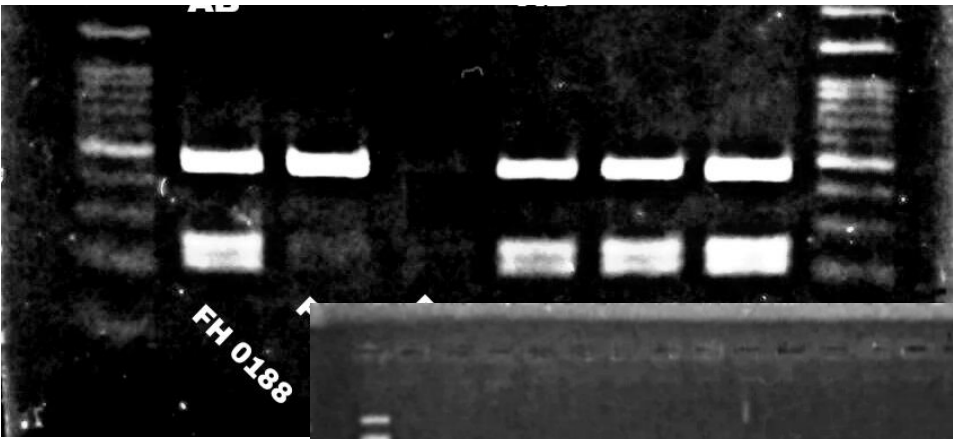
$$\begin{aligned} \bullet H_e &= 1 - \sum_{i=1}^q X_i^2 \\ &= 1 - (0,5^2 + 0,5^2) \\ &= 1 - (0,25 + 0,25) \\ &= 1 - 0,5 \\ &= 0,5 \end{aligned}$$

F. PIC (polymorphic information content)

$$\begin{aligned} \text{PIC} &= 1 - \sum_{i=1}^q X_i^2 - \sum_{i=1}^n \sum_{j=i+1}^n 2p_i^2 p_j^2 \\ &= 0,5 - (2 \times 0,25 \times 0,25) \\ &= 0,5 - 0,125 \\ &= \mathbf{0,375} \end{aligned}$$

Lampiran 2. Foto elektroforesis hasil PCR-RFLP





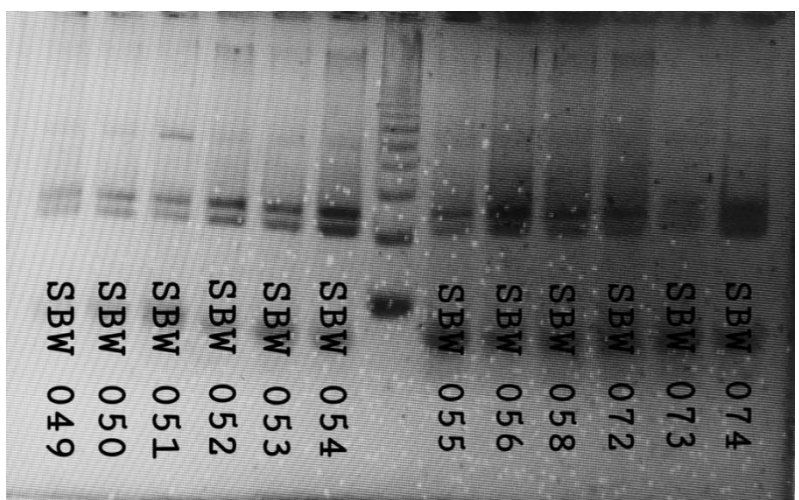
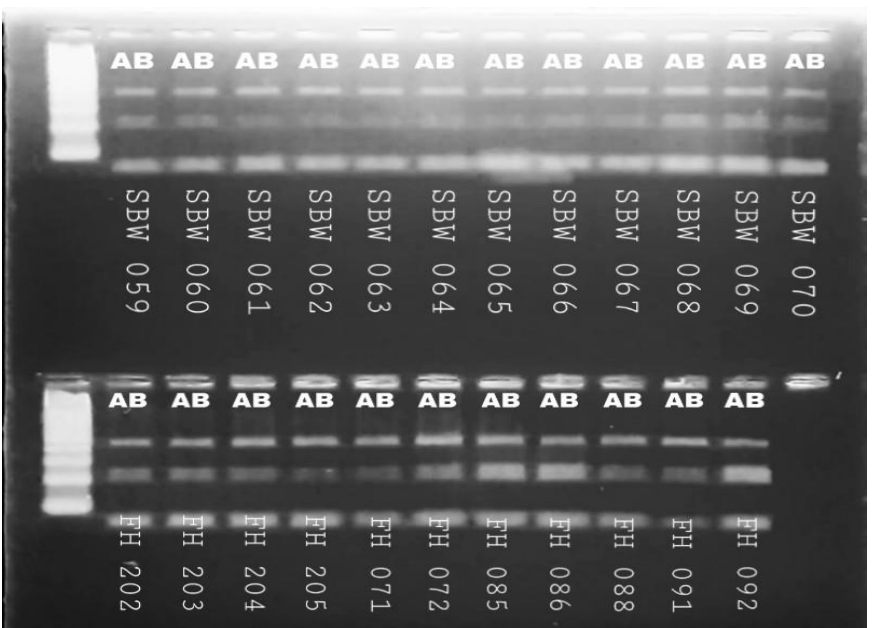
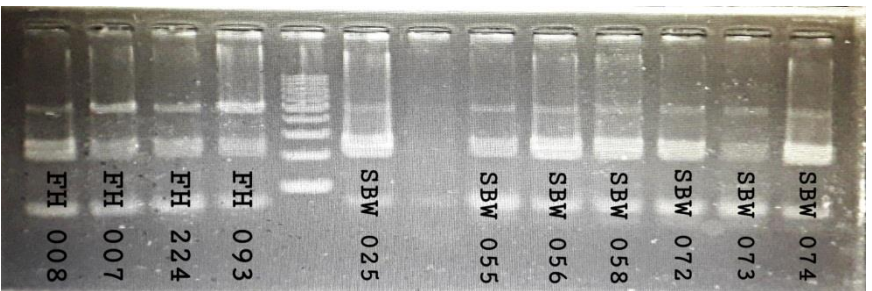
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FH 279
FH 278
FH 277
FH 276
FH 275
FH 274
FH 273
FH 272
FH 271
FH 270
FH 269
FH 268
FH 098
FH 097
FH 096
FH 095
FH 094
FH 281
FH 280

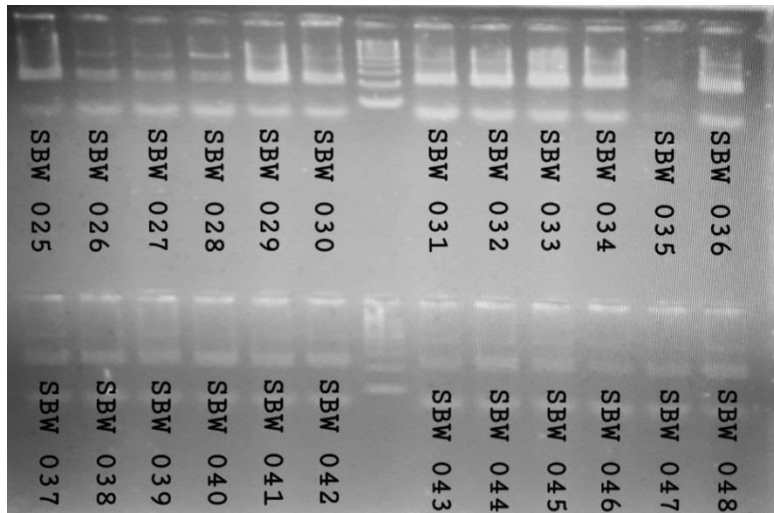
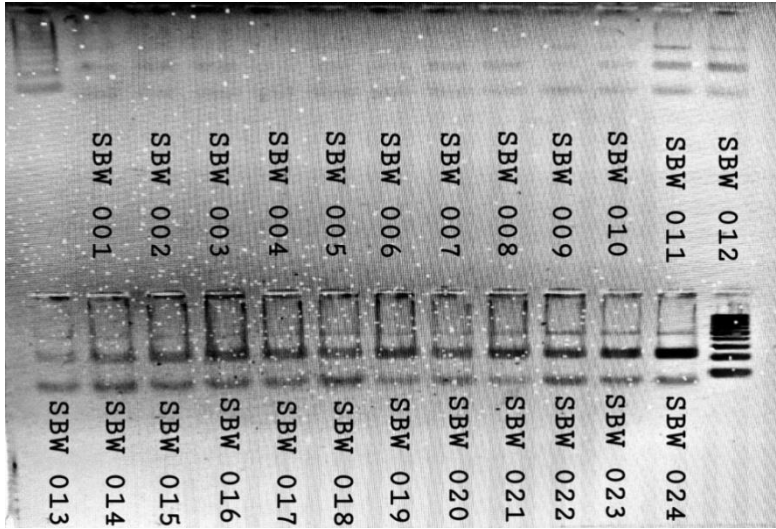
FH 170
FH 246
FH 155
FH 154
FH 153
FH 151
FH 150
FH 149
FH 148
FH 147
FH 146
FH 144
FH 267
FH 266
FH 265
FH 264
FH 263
FH 262
FH 261
FH 260
FH 259
FH 258
FH 257
FH 251
FH 084

FH 143
FH 135
FH 109
FH 106
FH 105
FH 104
FH 103
FH 102
FH 101

FH 221
FH 219
FH 218
FH 58
FH 57
FH 56
FH 55

FH 069
FH 067
FH 066
FH 065
FH 064
FH 063
FH 062
FH 061





Lampiran 3. Tabel genotip sapi FH

NO	Kode Sampel	Genotip
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1	FH 182	BB
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2	FH 183	BB
3	FH 184	BB
4	FH 185	AB
5	FH 186	BB
6	FH 187	BB
7	FH 188	AB
8	FH 189	AA
9	FH 236	AB
10	FH 191	AB
11	FH 192	AB
12	FH 193	AB
13	FH 156	AB
14	FH 157	AB
15	FH 158	AB
16	FH 159	AB
17	FH 160	AB
18	FH 161	AB
19	FH 162	AB
20	FH 163	AB
21	FH 164	BB
22	FH 165	BB
23	FH 166	AB
24	FH 167	AB
25	FH 168	AB
26	FH 169	BB
27	FH 171	AB
28	FH 172	AB
29	FH 173	AB
30	FH 174	AB
31	FH 175	AB
32	FH 176	AB
33	FH 177	BB
34	FH 178	BB
35	FH 179	BB
36	FH 180	AB
37	FH 025	BB
38	FH 026	BB
39	FH 027	AB
40	FH 028	AB
41	FH 029	AA
42	FH 030	BB

43	FH 031	AB
44	FH 032	AB
45	FH 033	AB
46	FH 034	AB
47	FH 035	AB
48	FH 036	AB
49	FH 037	BB
50	FH 038	AA
51	FH 039	AA
52	FH 040	BB
53	FH 041	BB
54	FH 042	AA
55	FH 043	BB
56	FH 044	BB
57	FH 045	AA
58	FH 046	AB
59	FH 047	BB
60	FH 048	AB
61	FH 049	AB
62	FH 050	AB
63	FH 051	AB
64	FH 052	AB
65	FH 053	AB
66	FH 054	AB
67	FH 055	BB
68	FH 056	BB
69	FH 057	BB
70	FH 058	AA
71	FH 059	AB
72	FH 060	AB
73	FH 217	AB
74	FH 218	BB
75	FH 219	BB
76	FH 220	AB
77	FH 221	BB
78	FH 222	BB
79	FH 223	AB
80	FH 224	AB
81	FH 225	BB
82	FH 226	AB
83	FH 227	AB

84	FH 228	BB
85	FH 001	AB
86	FH 002	AB
87	FH 003	AB
88	FH 004	AB
89	FH 005	AB
90	FH 006	AB
91	FH 007	AB
92	FH 008	AB
93	FH 009	AB
94	FH 010	AB
95	FH 011	AB
96	FH 012	AB
97	FH 013	BB
98	FH 014	AA
99	FH 015	AB
100	FH 016	AB
101	FH 017	AB
102	FH 018	AB
103	FH 019	AB
104	FH 020	AB
105	FH 021	AA
106	FH 022	BB
107	FH 023	AB
108	FH 024	AB
109	FH 073	AB
110	FH 074	AB
111	FH 075	AB
112	FH 076	AA
113	FH 077	AA
114	FH 078	AB
115	FH 079	AB
116	FH 080	AA
117	FH 081	AB
118	FH 082	AB
119	FH 083	AB
120	FH 084	AB
121	FH 246	BB
122	FH 251	AB
123	FH 257	AB
124	FH 269	BB

125	FH 270	AA
126	FH 271	BB
127	FH 272	BB
128	FH 273	AB
129	FH 274	BB
130	FH 275	AB
131	FH 276	AB
132	FH 277	BB
133	FH 278	AB
134	FH 279	AB
135	FH 280	AB
136	FH 281	AB
137	FH 093	AB
138	FH 094	AB
139	FH 095	AB
140	FH 096	AB
141	FH 097	AB
142	FH 098	AB
143	FH 101	BB
144	FH 102	AB
145	FH 103	BB
146	FH 104	AB
147	FH 105	BB
148	FH 106	BB
149	FH 109	BB
150	FH 135	BB
151	FH 143	BB
152	FH 144	BB
153	FH 146	AB
154	FH 147	AB
155	FH 148	AB
156	FH 149	BB
157	FH 150	BB
158	FH 151	BB
159	FH 152	AB
160	FH 153	AB
161	FH 154	BB
162	FH 155	AA
163	FH 258	AB
164	FH 259	AB
165	FH 260	BB

166	FH 261	AB
167	FH 262	AA
168	FH 263	BB
169	FH 264	AB
170	FH 265	AB
171	FH 266	BB
172	FH 267	BB
173	FH 268	AA
174	FH 194	AB
175	FH 195	AA
176	FH 196	AA
177	FH 197	AB
178	FH 198	AB
179	FH 199	AA
180	FH 200	AB
181	FH 201	AA
182	FH 202	AB
183	FH 203	AB
184	FH 204	AB
185	FH 205	AB
186	FH 061	BB
187	FH 062	AB
188	FH 063	BB
189	FH 064	AB
190	FH 065	AB
191	FH 066	AB
192	FH 067	AB
193	FH 069	AB
194	FH 071	AB
195	FH 072	AB
196	FH 085	AB
197	FH 086	AB
198	FH 088	AB
199	FH 091	AB
200	FH 092	AB

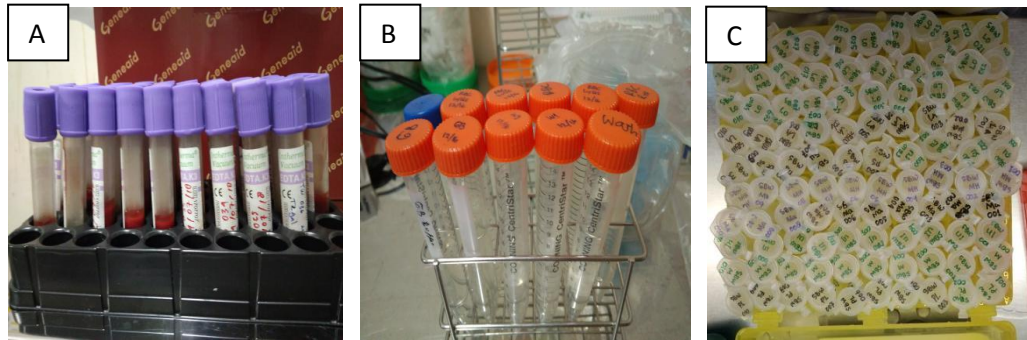
Lampiran 4. Tabel genotip sapi Sumbawa

NO	Kode Sampel	Genotip
1	SBW 059	AB
2	SBW 060	AB
3	SBW 061	AB
4	SBW 062	AB
5	SBW 063	AB
6	SBW 064	AB
7	SBW 065	AB
8	SBW 066	AB
9	SBW 067	AB
10	SBW 068	AB
11	SBW 069	AB
12	SBW 070	AB
13	SBW 001	AB
14	SBW 002	AB
15	SBW 003	AB
16	SBW 004	AB
17	SBW 005	AB
18	SBW 006	AB
19	SBW 007	AB
20	SBW 008	AB
21	SBW 009	AB
22	SBW 010	AB
23	SBW 011	AB
24	SBW 012	AB
25	SBW 013	AB
26	SBW 014	AB
27	SBW 015	AB
28	SBW 016	AB
29	SBW 017	AB
30	SBW 018	AB
31	SBW 019	AB
32	SBW 020	AB
33	SBW 021	AB
34	SBW 022	AB
35	SBW 023	AB
36	SBW 024	AB

37	SBW 025	AB
38	SBW 026	AB
39	SBW 027	AB
40	SBW 028	AB
41	SBW 029	AB
42	SBW 030	AB
43	SBW 031	AB
44	SBW 032	AB
45	SBW 033	AB
46	SBW 034	AB
47	SBW 035	AB
48	SBW 036	AB
49	SBW 037	AB
50	SBW 038	AB
51	SBW 039	AB
52	SBW 040	AB
53	SBW 041	AB
54	SBW 042	AB
55	SBW 043	AB
56	SBW 044	AB
57	SBW 045	AB
58	SBW 046	AB
59	SBW 047	AB
60	SBW 048	AB
61	SBW 049	AB
62	SBW 050	AB
63	SBW 051	AB
64	SBW 052	AB
65	SBW 053	AB
66	SBW 054	AB
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70	SBW 058	AB
71	SBW 071	AB
72	SBW 072	AB

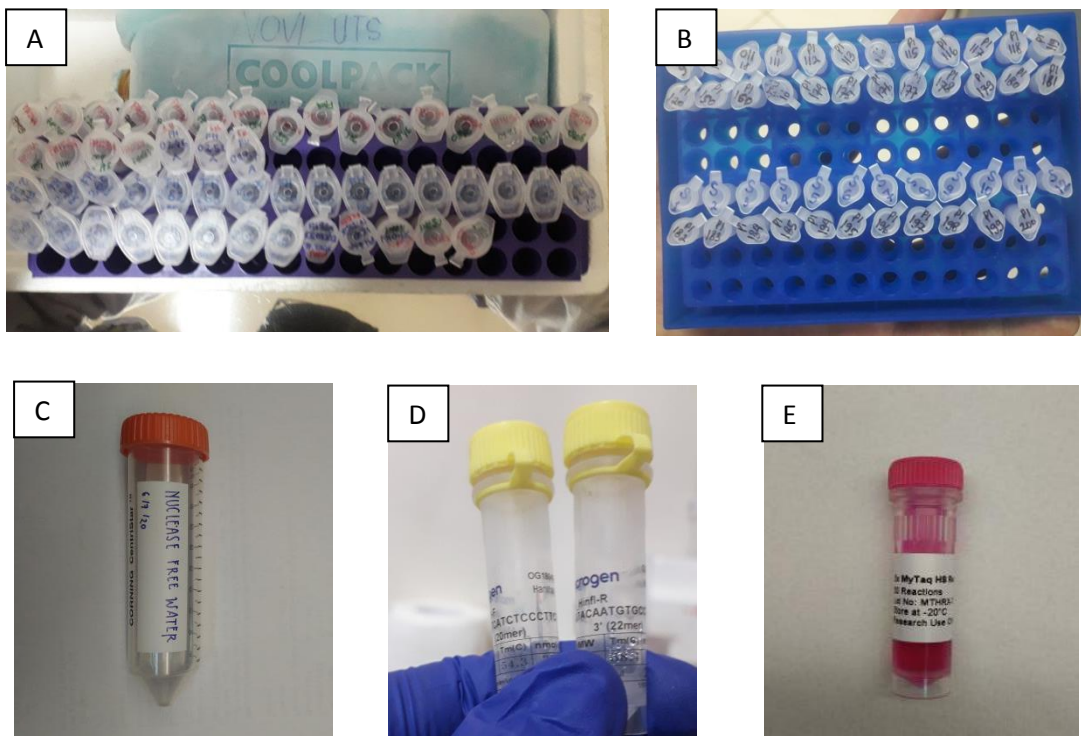
Lampiran 5. Foto Alat dan Kegiatan Penelitian

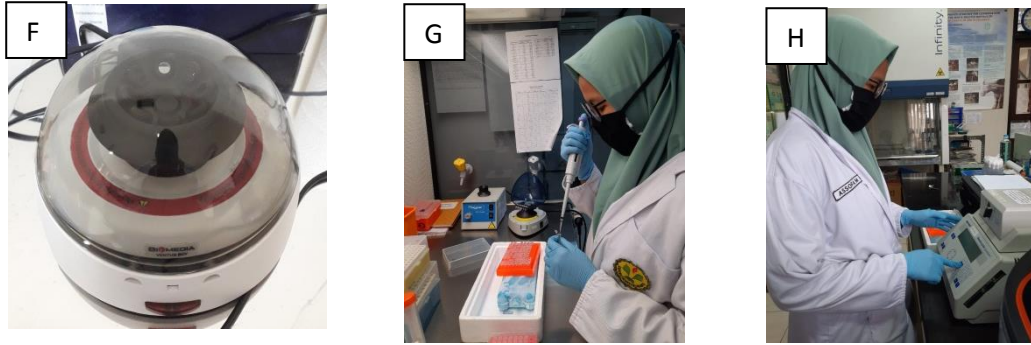
1. Isolasi DNA menggunakan DNA mini kit (Geneaid)



Gambar 9. (A) Sampel darah sapi FH, (B) Buffer DNA mini kit (Geneaid), (C) Sampel DNA siap pakai.

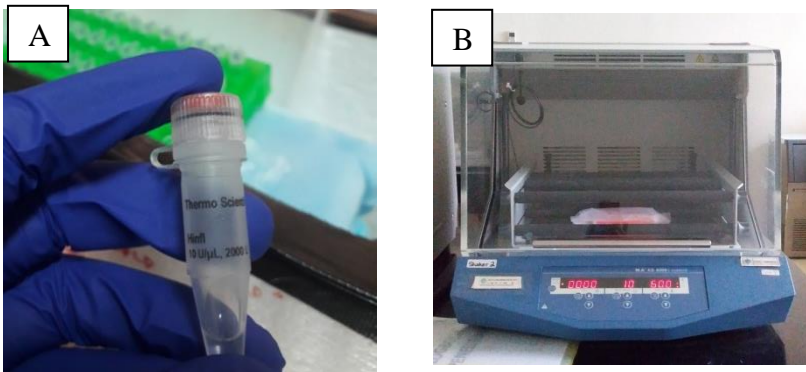
2. *Polymerase Chain Reaction (PCR)*





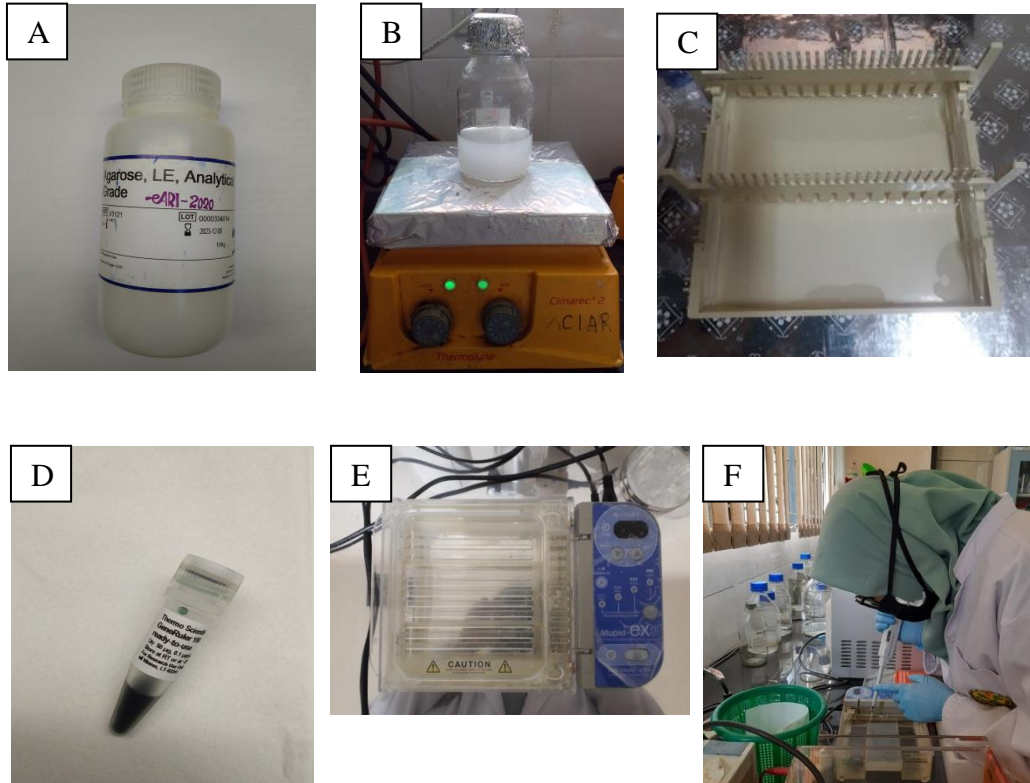
Gambar 10. (A) Proses *thawing* sampel DNA, (B) Tabung PCR, (C) *Nuclease Free Water*, (D) Primer *forward* dan *reverse*, (E) Master mix, (F) *Spindown*, (G) Proses pipetting PCR *mix* ke dalam tabung PCR, (H) *Setting program* PCR.

3. RFLP



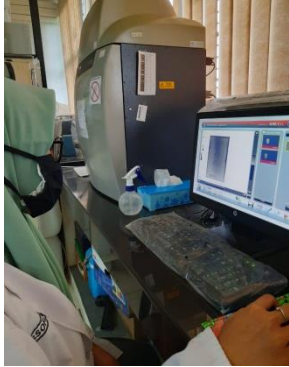
Gambar 11. (A) Enzim *HinfI* (Thermo scientific), (B) Proses inkubasi RFLP *mix* dalam *oven shaker*.

4. Elektroforesis



Gambar 12. (A) *Gel Agarose* (B) Proses pemanasan *gel agarose* menggunakan *hotplate*, (C) *Tray* elektroforesis, (D) *DNA Ladder*, (E) Mesin Elektroforesis, (F) Proses pipeting sampel ke dalam sumur *gel agarose*.

5. Visualisasi



Gambar 13. Proses pengamatan visualisasi pita DNA menggunakan GelBox untuk
(Syngene, USA).

