

IV. SIMPULAN DAN SARAN

A. Simpulan

Penelitian ini berhasil mendeteksi kontaminan jenis daging lain pada bakso sapi di pasar Kranggan dan pasar Beringharjo. Prosentase kontaminasi bakso sapi dari seluruh sampel adalah 7,69% terkontaminasi daging babi dan sebanyak 15,38% terkontaminasi daging ayam. Bakso sapi yang terkontaminasi daging babi berasal dari pasar Kranggan sedangkan bakso sapi yang terkontaminasi daging ayam berasal dari pasar Beringharjo.

B. Saran

Berdasarkan hasil penelitian ini, sebaiknya perlu dilakukan perbaikan metode ekstraksi DNA agar DNA hasil ekstraksi lebih murni dan analisis lanjutan mudah dilakukan. Hasil ekstraksi DNA juga dapat diencerkan agar hasil elektroforesis lebih jelas. DNA *ladder* yang digunakan untuk elektroforesis perlu diperhatikan agar dapat terlihat dengan jelas sehingga grafik semilog dapat dibuat dengan mudah.

Kuantitatif DNA juga sebaiknya dilakukan agar dapat diketahui apakah kontaminasi daging lain tersebut merupakan kesengajaan atau tidak. Pemantauan lebih lanjut terhadap bakso sapi yang dijual di pasar-pasar tradisional perlu dilakukan. Selain itu, penelitian sejenis terhadap berbagai jenis makanan olahan daging lainnya juga harus dilakukan agar kualitas produk makanan dapat terjaga dan konsumen dapat berbelanja dengan nyaman.

DAFTAR PUSTAKA

- Anonim. 1999. *Undang-Undang Republik Indonesia Nomor 8 Tahun 1999 tentang Perlindungan Konsumen*. Jakarta.
- Anonim. 2003. *DNA Extraction Protocol* #2. <http://www.hawaii.edu/microbiology/MO/dnaextract2.htm>. [13 Oktober 2009].
- Anonim. 2005. *Lougheed Genetics Laboratory Manual: DNA Extraction Protocols*. http://biology.queensu.ca/~eebcore/Lougheed_Protocols_05.pdf. [27 September 2009].
- Anonim. 2009. *Keterangan Pers Tentang Penjelasan Terkait Produk Dendeng/Abon Babi Nomor: Kh.00.01.1.53.1674*. <http://www.pom.go.id/>. [4 September 2009].
- BSN. 1995. *Standar Nasional Indonesia 01-3818-1995*. Dewan Standarisasi Nasional. Jakarta.
- Bellagamba, F., Moreti, V.M., Cominicini, S. & Valfre, F. 2001. Identification of Species in Animal Feedstuffs by Polymerase Chain Reaction–Restriction Fragment Length Polymorphism Analysis of Mitochondrial DNA. *J. of Agric. Food. Chem.* 49 (8): 3775–3781.
- Bodnar, J.W., Zempsky, W., Warder, D., Bergson, C. & Ward, D.C. 1983. Effect of Nucleotide Analogs on the Cleavage of DNA by the Restriction Enzymes *AluI*, *DdeI*, *HinfI*, *RsaI*, and *TaqI*. *Journal of Biological Chemistry* 258 (24): 15206–15213.
- Brooker, R.J. 2009. *Genetics: Analysis and Principles*. McGraw-Hill. New York.
- Brown, T.A. 2002. *Genomes*. Willey – Liss. Oxford.
- Calvo, J.H., Zaragoza, P. & Osta, R. 2001. Technical Note: A Quick and More Sensitive Method to Identify Pork in Processed and Unprocessed Food by PCR Amplification of a New Specific DNA Fragment. *J. Anim. Sci.* 8: 2108–2112.
- Cespedes, A., Garcia, T., Carrera, E., Gonzalez, I., Fernandez, A., Hernandez, P.E. & Martin, R. 1999. Application of Polymerase Chain Reaction – Single Strand Conformational Polymorphism (PCR–SSCP) to Identification of Flatfish Species. *JAOAC Int.* 82: 903–907.
- Dove, A. 1999. The Long Arm of DNA. *Nat Biotechnol* 17: 649 – 651.

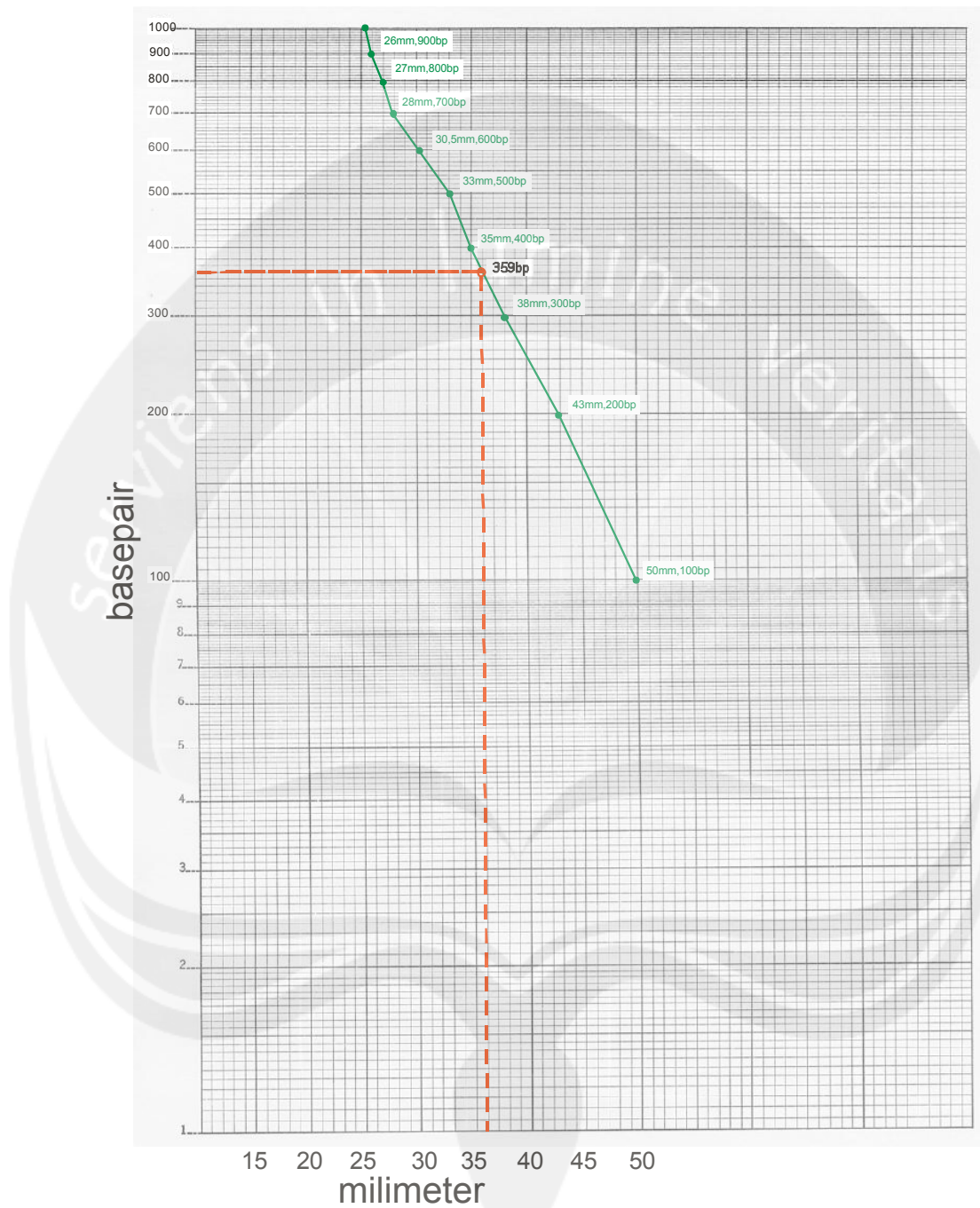
- Erwanto, Y., Abidin, M.Z., Rohman, A. & Sismindari. 2009. Pig Species Identification in Meatballs Using Polymerase Chain Reaction Restriction Fragment Length Polymorphism. *Proceedings of Bogor Agricultural University's Seminars*: 84–89.
- Fatchiyah. 2006. *Manipulasi Gen & RFLP Analisis*. <http://inherent.brawijaya.ac.id/biomol/materi/midterm/manipulasi%20dan%20RFLP.doc>. [29 September 2009].
- Ghovvati, S., Nassiri, M.R., Mirhoseini, S.Z., Moussavi, A.H. & Javadmanesh, A. 2009. Fraud Identification in Industrial Meat Product by Multiplex PCR Assay. *Journal Food Control* 20: 696-699.
- Girindra, A. 2006. Menjamin Kehalalan dengan Label Halal. *Perspektif Food Review Indonesia* 1 (9): 12-13.
- Greiner, R. & Konietzny, U. 2007. *Modern Molecular Methods (PCR) in Food Control: GMO, Pathogens, Species Identification, Allergens*. <http://www.worldfoodscience.org>. [6 September 2009].
- Hsieh, H., Tsai, C., Tsai, L., Chiang, H., Huang, N., Rocky, T.S., Linacre, A. & Lee, J.C. 2005. Species Identification of Meat Products Using the Cytochrome b Gene. *Forensic Science Journal* 4: 29-36.
- Kocher, T.D., Thomas, W.K., Meyer, A., Edwards, S.V., Pääbo, S., Villablanca, F.X. & Wilson, A.C. 1989. Dynamics of Mitochondrial DNA Evolution in Animals: Amplification and Sequencing with Conserved Primers. 1989. *Proc. Natl. Acad. Sci. U. S. A.* 86: 6196-6200
- Koh, M. C., Lim, C. H., Chua, S. B., Chew, S. T. & Phang, S. T. W. 1998. Random Amplified DNA Fingerprints for Identification of Red Meat Animal Species. *Meat Sci.* 48: 275–285.
- Leksono, T. & Syahrul. 2001. Studi dan Penerimaan Konsumen terhadap Abon Ikan. *Jurnal Natur Indonesia* III (2): 178–184.
- Lenstra, J., Buntier, J.B. & Janssen, F.W. 2001. On the Origin of Meat – DNA Techniques for Species Identification in Meat Products. *Veterinary Science Tomorrow* 2: 1-15.
- Li, X., Song, C., Zhao, M. & Li, Y. 2008. Continuous Monitoring of Restriction Endonuclease Cleavage Activity by Universal Molecular Beacon Light Quenching Coupled with Real-Time Polymerase Chain Reaction. *Analytical Biochemistry* 381: 1-7.

- Lockley, A.K. & Bardsley, R.D. 2000. DNA-based Method for Food Authentication. *Trends in Food Science & Technology* 11: 67-77.
- Lopez-Andreo, I., Lugo, L., Garrido-Pertierra, A., Prieto, M. I. & Puyet, A. 2005. Identification and Quantitation of Spesies in Complex DNA Mixture by Real-Time Polymerase Chain Reaction. *Analytical Biochemistry* 339: 73-82.
- Lourenço, L.B., Garcia, P.C.A. & Recco-Pimentel, S.M. 2003. Restriction fragment analysis of the ribosomal DNA of *Paratelmatobius* and *Scythrophrys* species (Anura, Leptodactylidae). *Genetics and Molecular Biology* 26 (2): 139-143.
- Maede, D. 2006. A strategy for molecular species detection in meat and meat products by PCR-RFLP and DNA sequencing using mitochondrial and chromosomal genetic sequences. *Eur Food Res Technol* 224: 209-217.
- Margawati & Ridwan. 2010. Pengujian Pencemaran Daging Babi pada Beberapa Produk Bakso dengan Teknologi PCR: Pencarian Sistem Pengujian Efektif. *Berita Biologi* 10 (1): 93-98.
- Martinez, I. & Man, Y. 1998. Species Identification in Meat Products by RAPD Analysis. *Food Res. Int.* 31 (6-7): 459-466.
- Meyer, A. 1994. Shortcomings of the Cytochrome b Gene as a Molecular Marker. *Trend Ecol Evol* 9 (8): 278-280.
- Meyer, A., 2001, The Cytochrome b Gene as a Phylogenetic Marker: The Limits of Resolution for Analyzing Relationships Among Cichlid Fishes, *Journal of Molecular Evolution* 53: 89-103.
- Neto, D.E. Caballero, O.L. Vidigal, T. Pena, S. & Simpson, A. 1994. Producing Randomly Amplified Polymorphic DNAs from Degraded DNA. *Workshop of Genomic Fingerprinting*. 20: 94-95.
- Nurbowo. 1995. Bakso Nikmat Tanpa Babi. *Jurnal Halal* 6 (1): 13-17.
- Nurwahid. 1997. Awas Abon Babi. *Jurnal Halal* 18 (3): 1-5.
- Ong, S.B., Zurani, M.I., Jurin, W.G., Cheah, Y.K., Tunung, R., Chai, L.C., Haryani, Y., Ghazali, F.M. & Son, R. 2007. Meat Molecular Detection: Sensitivity of Polymerase Chain Reaction-Restriction Fragment Length Polymorphism in Species Differentiation of Meat from Animal Origin. *ASEAN Food Journal* 14 (1): 51-59.

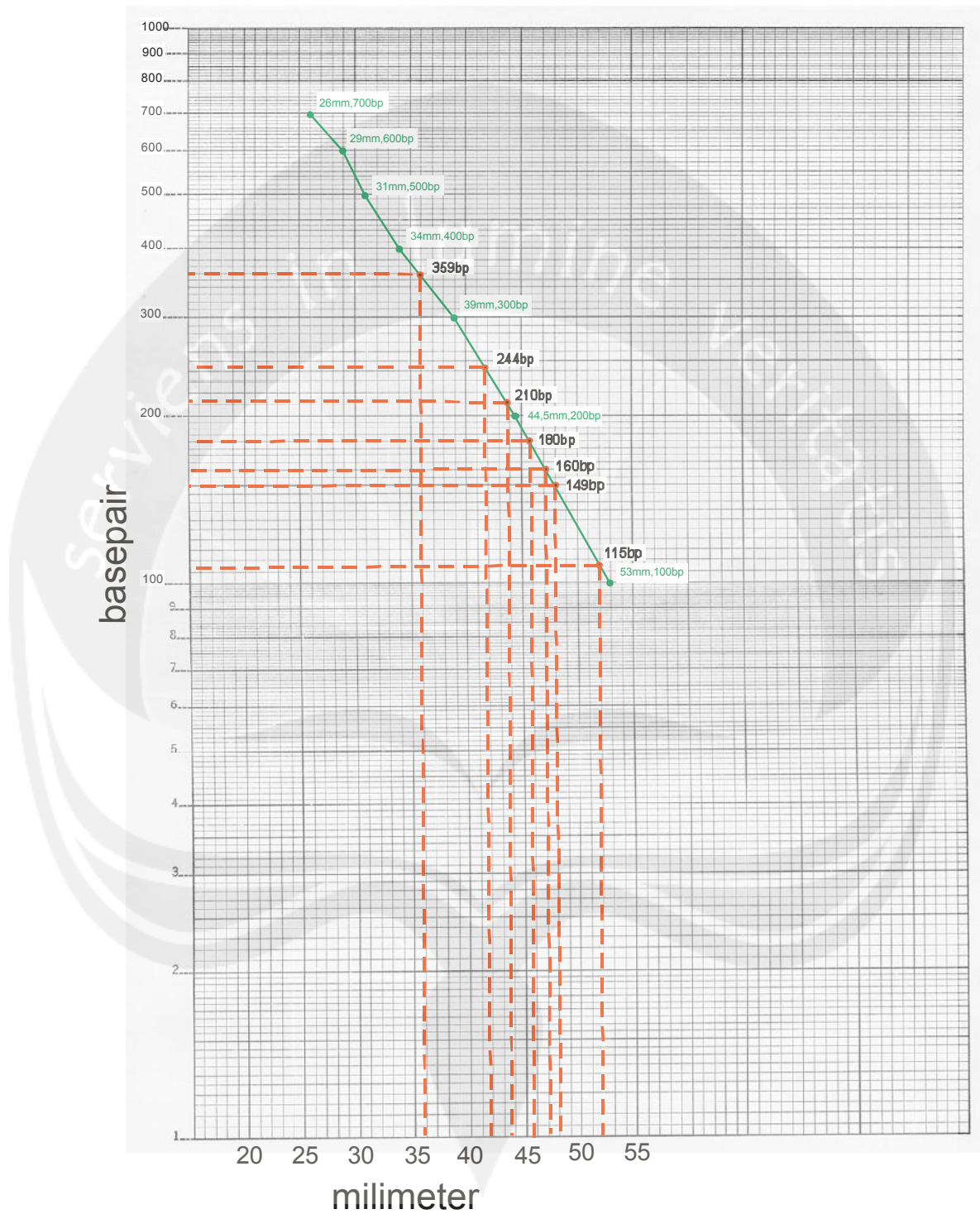
- Pascoal, A., Prado, M., Castro, J., Cepeda, A. & Barrosvelásquez, J. Survey of Authenticity of Meat Species in Food Products Subjected to Different Technological Processes, by Means of PCR-RFLP Analysis. 2004. *Eur. Food Res. Technol* 218: 306-312.
- Prastuti, N. T. 2010. *Pengaruh Substitusi Daging Sapi dengan Kulit Cakar Ayam terhadap Daya Ikat Air (Dia), Rendemen dan Kadar Abu Bakso*. Skripsi. Fakultas Peternakan Universitas Diponegoro. Semarang.
- Rastogi, G., Dharne, M., Bharde, A., Pandav, S., Ghumatkar, S.V., Krishnamurthy, R., Patole, M.S. & Shouche, Y.S. 2004. Species Determination and Authentication of Meat Samples by Mitochondrial 12s rRNA Gene Sequence Analysis and Conformation-sensitive Gel Electrophoresis. *Current Science* 87 (9): 12787-1281
- Rea, S., Chikuni, K. & Avellini, P. 1996. Possibility of Using Single Strand Conformation Polymorphism (SSCP) Analysis for Discriminating European Pig and Wild Boar Meat Samples. *Ital. J. Food Sci.* 3: 211-220.
- Rehbein, H., Mackie, I.M., Pryde, S., Gonzales-Sotelo, C., Perez-Martin, R.I., Quinteiro, J. & Rey-Mendez, M. 1995. Fish Species Identification in Canned Tuna by DNA Analysis (PCR-SSCP). *Inf. Fischwirtsch* 42: 209-212.
- Rehbein, H., Kress, G. & Schmidt, T. 1997. Application of PCR-SSCP to Species Identification of Fishery Products. *J. Sci. Food Ag.* 74: 35-41.
- Rehbein, H., Mackie, I.M., Pryde, S., Gonzales-Sotelo, C., Perez-Martin, R.I., Quinteiro, J. & Rey-Mendez, M. 1998. Comparison of Different Methods to Produce Single Strand DNA for Identification of Canned Tuna by Single-Strand Conformation Polymorphism Analysis. *Electrophoresis* 19: 1381-1384.
- Rehbein, H., Kress, G. & Schmidt, T. 1999. Application of PCR-SSCP to Species Identification of Fishery Products. *J. of Sci. of Food and Agri.* 74 (1): 35-41.
- Saiki, R.B. Gelfand, D.H. Stoffel, S. Scharf, S.J. Highuji, R. Horn, G.T. Mullis, K.B. & Erlich, H.A. 1988. Primer – Directed Enzymatic Amplification of DNA with a Thermostable DNA Polymerase. *Meat Sci.* 239: 487-491.
- Soedjono, R.D. 2004. Detection of Porcine Meat in Meat Products by using Polymerase Chain Reaction Technique. *Jurnal Veteriner* 5 (3): 116-126.
- Soeparno. 1998. *Ilmu dan Teknologi Daging*. UGM Press. Yogyakarta.

- Sudjadi. 2008. *Bioteknologi Kesehatan*. Penerbit Kanisius. Yogyakarta.
- Sunarlim, R. 1992. *Karakteristik Mutu Bakso Sapi dan Pengaruh Penambahan NaCl dan STPP terhadap Perbaikan Mutu*. Thesis. Program Studi Pasca Sarjana. Institut Pertanian Bogor. Bogor.
- Suprpti, M.L. 2003. *Bakso Daging dan Bakso Ikan*. Penerbit Kanisius. Yogyakarta.
- Teletchea, F., Maudet, A. & Hanni, C. 2005. Food and Forensic Molecular Identification : Update and Challenges. *TRENDS in Biotechnology* 23 (7): 359-366.
- Thenawijaya, M. 1995. *Dasar – dasar Biokimia*. Erlangga. Jakarta.
- Usman. 1997. Mesin Produksinya Satu. *Jurnal Halal* 17 (3): 8-14.
- Verkaar, E.L.C., Nijman, I.J., Boutaga K. & Lenstra, J.A. 2002 Differentiation of Cattle Species in Beef by PCR-RFLP of Mitochondrial and Satellite DNA. *Meat Science* 60: 365-369
- Wibowo, S. 1995. *Bakso Ikan dan Bakso Daging*. Penebar Swadaya. Jakarta.
- Woolfe, M. & Primrose, S. 2004. Food Forensics: Using DNA Technology to Combat Misdescription and Fraud. *Trends in Biotechnology* 22 (5): 222-226.
- Yuwono, T. 2006. *Teori dan Aplikasi Polymerase Chain Reaction*. Andi Offset. Yogyakarta.

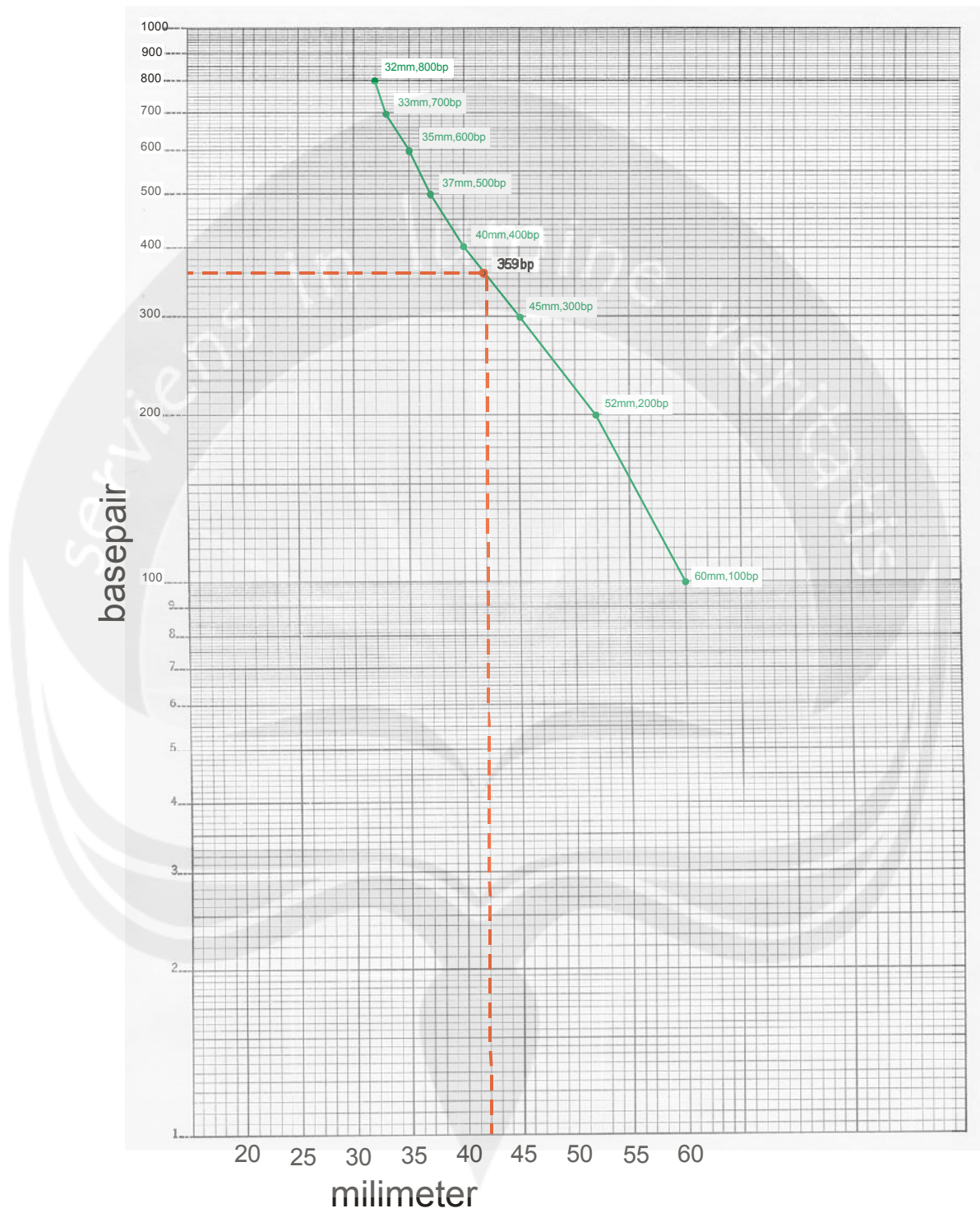
Lampiran 1. Grafik Semilog hasil PCR



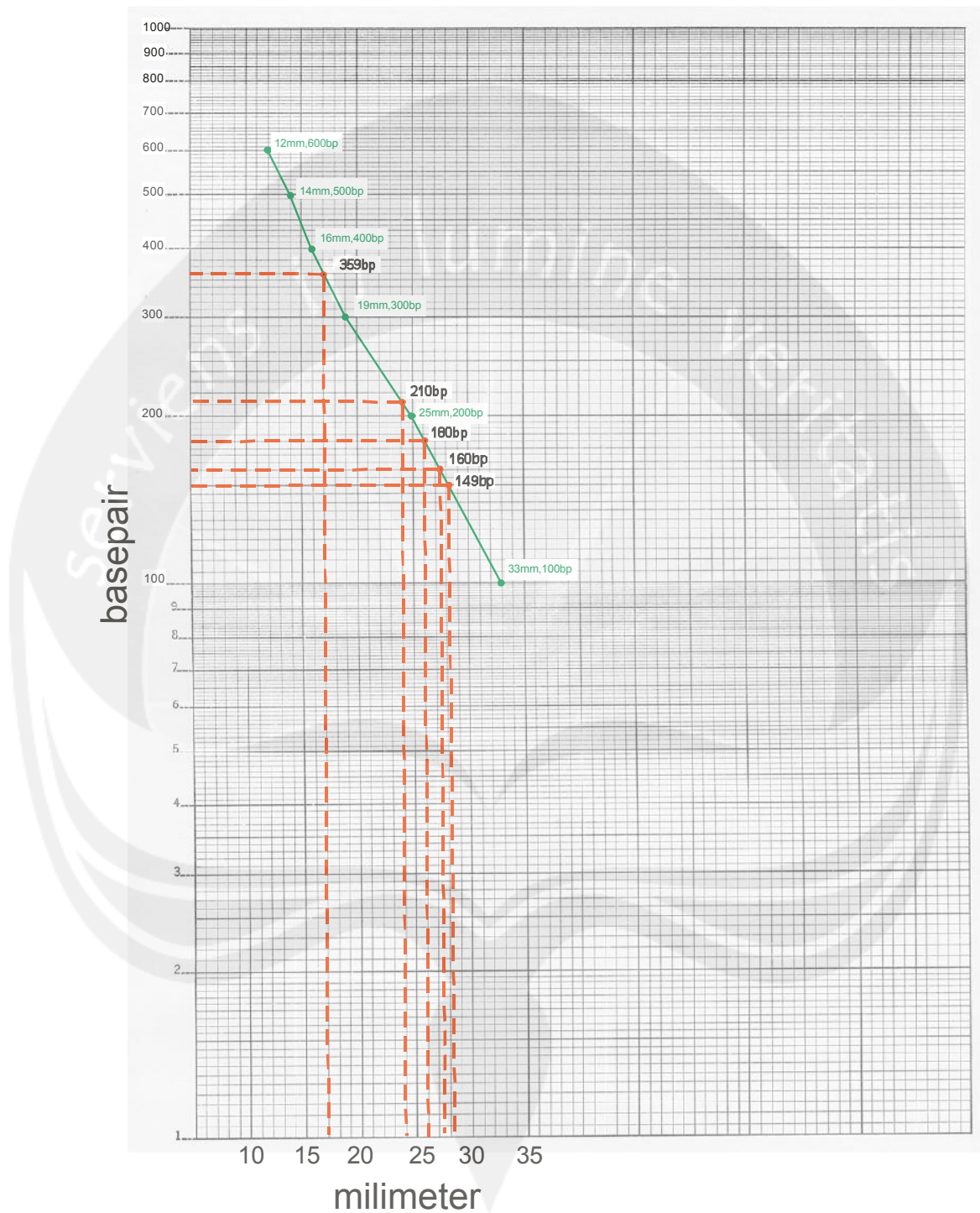
Gambar 9. Grafik semilog elektroforesis hasil PCR sampel i – p



Gambar 10. Grafik semilog elektroforesis hasil PCR-RFLP enzim restriksi *AluI* dan *RsaI* sampel a – h



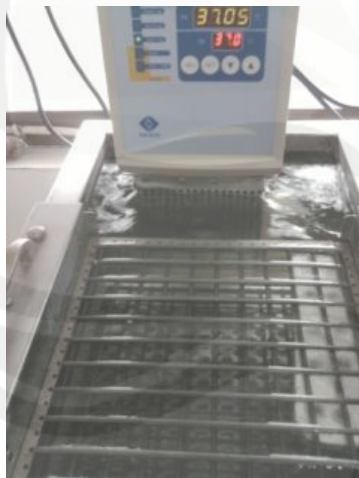
Gambar 11. Grafik semilog elektroforesis hasil PCR-RFLP enzim restriksi *Bam*HI sampel a – h



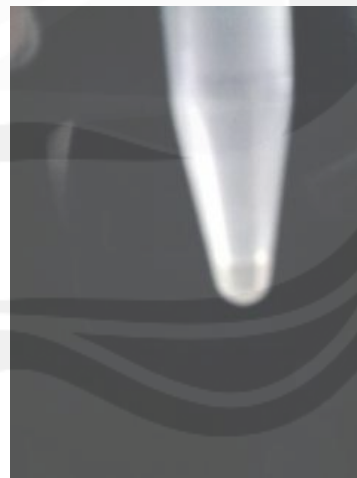
Gambar 12. Grafik semilog elektroforesis hasil PCR-RFLP enzim restriksi *AluI* dan *RsaI* sampel i – p



Gambar 13. Sampel bakso sapi dicincang



Gambar 14. Inkubasi sampel selama satu malam



Gambar 15. Hasil ekstraksi



Gambar 16. Elektroforesis hasil ekstraksi



Gambar 17. PCR DNA total