



Sustainable Livestock Production in the Perspective of
Food Security, Policy, Genetic Resources, and Climate Change

Proceedings Full Papers

10-14 November 2014, Yogyakarta, INDONESIA



The 16th AAAP Congress

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Ministry of Agriculture



Indonesian Society of Animal Sciences



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**SUSTAINABLE LIVESTOCK PRODUCTION IN THE
PRESPECTIVE OF FOOD SECURITY, POLICY, GENETIC
RESOURCES, AND CLIMATE CHANGE**

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Editors:

Subandriyo
Kusmartono
Krishna Agung Santosa
Edi Kurnianto
Agung Purnomoadi
Akhmad Sodik
Komang G. Wiryawan
Siti Darodjah
Ismeth Inounu
Darmono
Atien Priyanti
Peter Wynn
Jian Lin Han
Jih Tay-Hsu
Zulkifli Idrus

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Asian-Australasian Association of Animal Production Societies

✧ **Scope of AAAP:** AAAP is established to devote for the efficient animal production in the Asian-Australasian region through national, regional, international cooperation and academic conferences.

✧ **Brief History of AAAP:** AAAP was founded in 1980 with 8 charter members representing 8 countries-those are Australia, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines and Thailand. Then, the society representing Taiwan joined AAAP in 1982 followed by Bangladesh in 1987, Papua New Guinea in 1990, India and Vietnam in 1992, Mongolia, Nepal and Pakistan in 1994, Iran in 2002, Sri Lanka and China in 2006 , thereafter currently 19 members.

✧ **Major Activities of AAAP:** Biennial AAAP Animal Science Congress, Publications of the Asian-Australasian Journal of Animal Sciences and proceedings of the AAAP congress and symposia and Acknowledgement awards for the contribution of AAAP scientists.

✧ **Organization of AAAP:**

- President: Recommended by the national society hosting the next biennial AAAP Animal Science Congress and approved by Council meeting and serve 2 years.
- Two Vice Presidents: One represents the present host society and the other represents next host society of the very next AAAP Animal Science Congress.
- Secretary General: All managerial works for AAAP with 6 years term by approval by the council
- Council Members: AAAP president, vice presidents, secretary general and each presidents or representative of each member society are members of the council. The council decides congress venue and many important agenda of AAAP

✧ **Office of AAAP:** Decided by the council to have the permanent office of AAAP in Korea. Currently # 909 Korea Sci &Tech Center Seoul 135-703, Korea

✧ **Official Journal of AAAP:** Asian-Australasian Journal of Animal Sciences (Asian-Aust. J. Anim. Sci. ISSN 1011-2367. <http://www.ajas.info>) is published monthly with its main office in Korea

✧ **Current 19 Member Societies of AAAP:**

ASAP(Australia), BAHA(Bangladesh), CAASVM(China), IAAP(India), ISAS(Indonesia), IAAS(Iran), JSAS(Japan), KSAST(Korea), MSAP(Malaysia), MLSBA(Mongolia), NASA(Nepal), NZSAP(New Zealand), PAHA(Pakistan), PNGSA(Papua New Guinea), PSAS(Philippines), SLAAP(Sri Lanka), CSAS(Taiwan), AHAT(Thailand), AHAV(Vietnam).

✧ **Previous Venues of AAAP Animal Science Congress and AAAP Presidents**

I	1980	Malaysia	S. Jalaludin	II	1982	Philippines	V. G. Arganosa
III	1985	Korea	In Kyu Han	IV	1987	New Zealand	A. R. Sykes
V	1990	Taiwan	T. P. Yeh	VI	1992	Thailand	C. Chantalakhana
VII	1994	Indonesia	E. Soetirto	VIII	1996	Japan	T. Morichi
IX	2000	Australia	J. Ternouth	X	2002	India	P. N. Bhat
XI	2004	Malaysia	Z. A. Jelan	XII	2006	Korea	I. K. Paik
XIII	2008	Vietnam	N.V. Thien	XIV	2010	Taiwan	L.C. Hsia
XV	2012	Thailand	C.Kittayachaweng	XVI	2014	Indonesia	Yudi.Guntara.Noor

Remark from Chairman of the 16th AAAP Congress

Dear all of the scientists, delegates, participants, ladies and gentlemen,

As the host of the 16th AAAP Animal Science Congress, we do impress, thankful, and present a high appreciation for your participation in joining the 16th AAAP Conference in Yogyakarta, Indonesia. We can see the very great enthusiasm of all the scientists to solve livestock problems as well as to share valuable information and knowledge for human prosperity all over the world.

A large numbers of representatives are participating in this conference, which indicates that the interest in the field of animal science is continuously increasing among member countries. We have invited some Plenary Speakers and Invited Papers who are qualified as scientists and bureaucrats in animal science field to share their valuable information and knowledge. Other participants can deliver their precious research through oral and poster presentations. This congress is also paralleled to symposium held by livestock organization and institution as well as some academic meetings.

The theme of the 16th AAAP Congress is “Sustainable Livestock Production in the perspective of Food security, Policy, Genetic Resources and Climate Change”. We believe that animal production in Asia and Australasia has become important and strategic sector to provide high quality food, opening up job opportunities, as well as improving farmer’s welfare. Animal science societies, therefore, have to support this growing interest by providing more appropriate and relevant technologies to improve efficiency of resources utilization to produce more animal protein food by member countries. Long term sustainable livestock production will, therefore, be significantly influenced by the national food policy, climate change issues, as well as conserved environments and genetic resources.

On behalf of 16th AAAP Committee and all associates, we wish all of the participants having a great achievement of success and fulfill the expectation as well as enjoying the interaction with all scientists participating the Congress.

High appreciation we may acknowledge to all of sectors, especially for His Majesty of Royal Palace of Yogyakarta, Sri Sultan Hamengku Buwono X, and Rector of Universitas Gadjah Mada, who have concerned to facilitate the Congress site host. Special thank to the Steering Committee, Scientific Committee, Reviewers and Editorial Boards for their great contribution to make the Congress successfully organized.

To you, your excellencies, invited guests and delegates, thank you for choosing to come to this conference and to Indonesia. We hope the arrangements we have put in place meet with your requirements. We wish you fruitful deliberations and an intellectually and socially rewarding stay in Yogyakarta.

We are looking forward to meeting you all in the future congress to continue.

Terimakasih (Thank you)



Budi Guntoro

Chairman of the 16th AAAP Congress

16th AAAP PRESIDENT'S REPORT

Selamat pagi!

Dear Ladies and Gentleman

Attendants of 16 AAAP congress:

It is my great pleasure and honor to welcome all of you at The 16th AAAP Congress on November 10 – 14, 2014 at Grha Sabha Pramana, Universitas Gadjah Mada, Yogyakarta Indonesia. This Congress is jointly organized by The Indonesian Society of Animal Science (ISAS), Indonesian Agency for Agricultural Research and Development, Indonesian Directorate General of Livestock and Animal Health Services-Ministry of Agriculture and Faculty of Animal Science Universitas Gadjah Mada. Universitas Gadjah Mada Campus is located in Yogyakarta, one of the Special Region in Indonesia where culture and tradition live in harmony with the modern nuance and educational spirit makes it a beautiful venue of this Congress.

The 16th AAAP Program consists of scientific and technical programs as well as social and cultural activities. The scientific and technical programs offer five plenary sessions, two satellite symposia, field trip, and many scientific sessions, both oral and poster presentations.

During this event distinguished scientists from all over the world will present plenary papers ranging from livestock policy, food security, local genetic resources, climate change, animal welfare, international trade, as well as global research agenda. I believe that around 1,200 scientists as well as livestock producers, companies, graduate and postgraduate students from 40 countries are attending the Congress and more than 770 research papers will be presented. The Congress also provides not only opportunities to discuss and exchange information and experience with scientists from different regions of the world, but also a good environment to build up friendship between nations is our ultimate goals for the Congress outcome. Moreover, this congress also keeps its tradition to be a forum of communication among researchers, academician, industries and related stakeholders among Asian-Australasian countries.

The social and cultural programs are specially designed to be very important for the congress participants since the promotion of friendship and future scientific cooperation are also central to this AAAP Congress. The Opening Ceremony will offer you the Congress Program at a glance. In addition, participants will also join at a warm Welcome Dinner gathering at Keraton Yogyakarta. Sri Sultan Hamengku Buwono X, His Majesty of The Royal Palace of Yogyakarta will give you the most memorable moment during this event.


Moreover, cultural night offers us an opportunity to introduce significant culture from participants' countries and gives a spectacular performance to enjoy in order to strengthen our friendship and future cooperation. Field trip, on the other hand, provides a wonderful sightseeing to the most valuable ancient heritage around Yogyakarta, such as Borobudur and Prambanan Temples, and more other interesting places to visit. I do hope that you enjoy your stay in Yogyakarta and not miss all of these spectacular opportunities.

Closing Ceremony will be held on November 14, 2014 immediately after the last session of presentation. During this great moment we will welcome the next host of the 17th AAAP Congress to deliver a brief message. The AAAP Congress Award will provide and announce some participant who receive appreciation for their valuable research.

With all of our hospitality, we will try our best to make your brief visit to Yogyakarta and our beautiful country Indonesia, become a wonderful experience and memorable moments.

I wish you all a very pleasant and most enjoyable stay in Yogyakarta, Indonesia.

Terima kasih (Thank you).

A handwritten signature in black ink, appearing to read 'Y. Guntara Noor', written over a diagonal line that extends from the bottom left towards the right.

Sincerely Yours
Mr. Yudi Guntara Noor
President
The 16th AAAP Congress

PREFACE

The proceedings of the 16th Congress of the Asian-Australasian Association of Animal Production Societies (AAAP) held on 10-14 November 2014 at Grha Sabha Pramana, Universitas Gadjah Mada, Yogyakarta, Indonesia, consist of two volumes. Those are Volume I of Plenary and Invited Papers and Volume II of Abstracts Contributed Papers. This is the second volume of the proceedings that contains a total of 754 abstracts, consist of 368 papers for oral presentation and 386 papers for poster. Papers were categorized into various disciplines, such as Nutrition and Feed Technology; Genetics and Reproduction; Physiology, Animal Welfare and Health Management; Product Technology and Food Safety; Waste and Environmental issues; Forage Agrostology; as well as Agribusiness, Marketing, Extension and Community Development. The scientific committee has initially received a total of 1,028 abstracts from 42 countries. After reviews have been made, 60 of them were rejected and 74 were cancelled by the authors. The reviewers consist of 4 international and 71 internal reviewers from 6 universities and 1 research institute in Indonesia. In the interest of time limitation for proceedings publication, we apologize for not including 140 submitted abstracts in the proceedings since they were not being followed up with full manuscripts until the extended due date we offered.

The scientific committee would like to thank all the reviewers and appreciate their effort to make significant contribution in reviewing the full manuscripts. Similarly, we would also like to thank supporting staffs at the secretariat office of the Faculty of Animal Science, Universitas Gadjah Mada as well as of the Indonesian Center for Animal Research and Development who have helped in the preparation of the proceedings. Finally, we would like to thank all the authors for their valuable contribution to the congress and make it useful for our societies.

Editorial Team

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B 412 DZ	Effects of Marl and Kaolin on Growth Performances, Digestive Efficiency and Wet Droppings of Broiler Chickens <i>D. Ouachem, A. Meredef, A. Kalli, N. Kaboul, A. Mehdaoui, and Z. Ahmed Gaid</i>	1958

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B 788 TW	Effects of Dietary Supplementation of Sorghum Distillery Residue and Its Solid Fermented Product on Growth Performance and Immune Response in Broilers <i>P. H. Lin, Y. T. Chen, F. C. Tsai, S. M. Lee, and I. H. Chen</i>	1987
B 853 NG	Growth Performance and Organoleptic Properties of Broilers Fed Rumen Filtrate Fermented Shea Nut (<i>Vitellaria paradoxa</i>) Meal <i>D. N. Tsado and J. Akinwolere</i>	1991
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B 872 KR	Effects of Gromax [®] Supplementation on Growth Performance, Carcass Traits, Blood Profiles and Secretion of IGF-1 in Broiler Chickens <i>J. S. Hong, G. I. Lee, J. M. Kim, H. S. Choi and Y. Y. Kim</i>	1999

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B 957 LK	Effect of Phytase Enzyme on Phosphorous Availability of Broiler and Breeder Rations <i>M. A. J. P. Munasinghe, R. M. A. S. Bandara, B.C. Gallawattage and G. Weerakkody</i>	2005
B 1018 TW	Effect of Pelleting of Two Stage Fermented Process on Feed Composition, Broiler Growth Performance and Nutrition Digestibility <i>R. H. Yeh and K. L. Chen</i>	2008
B 1019 TW	Two Stage Fermented Process Improved Standardized Ileal Amino Acid Digestibility of Feather Meal in Broilers <i>K. L. Chen and R. H. Yeh</i>	2012
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B 1027 TW	Metabolizable Energy of Local Grown Cassava in Taiwan and the Feasibility in Replacement for Corn in Broiler Feedstuff <i>S.R. Lee, L. Ananda, Y.H. Chen, B.H. Lin and S.Y. Wang</i>	2024
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The Characteristics of Volatile Compounds of Smoke-Treated-Meat Using Kenari (*Canarium indicum* L.) Shell Liquid Smoke

Yusnaini¹, Soeparno², Edi Suryanto² and Ria Armunanto³

¹Departement of Animal Husbandry, Faculty of Agriculture, Universitas Khairun, Ternate, Indonesia, ²Departement of Animal Production Technology, Faculty of Animal Husbandry, Universitas Gadjah Mada, Yogyakarta, Indonesia, ³Departement of Chemistry, Faculty of Mathematics and Natural Science, Universitas Gadjah Mada, Yogyakarta, Indonesia

Corresponding e-mail: yusnaini_unkhair@yahoo.co.id

ABSTRACT

The study was aimed to the qualitative and quantitative properties of volatile compounds of smoke-treated-meat using Kenari (*Canarium indicum* L.) shell liquid smoke. Five levels of dilution were applied to *Longissimus dorsi* of beef. The meat was cut into small pieces of about 5 cm x 5 cm x 2 cm and dipping for 15 minutes. The meat was drained and each treatment was conducted in 5 (five) replications at different time. The variables measured were yield of qualitative and quantitative properties of the volatile compounds of cooked smoke-meat using GC and GC-MS. The data of qualitative and quantitative properties of volatile compounds of raw smoke-meat and cooked smoke-meat were analyzed descriptively. The results showed that the number of volatile compounds that could be detected on raw smoke-meat was 17 compounds (1 acetic acid, 10 carbonyl and 6 phenolic). It proved that liquid smoke of kenari shell could serve as developer of meat flavor. The major components of the raw smoke-meat were furfural and guaiacol.

Key Words: Volatile Compounds, Smoke-Treated-Meat, Kenari Shell, Liquid Smoke

INTRODUCTION

Kenari tree is one of the original Indonesian plantations that grow in Eastern Indonesia. Kenari consists of exocarp, mesocarp, shell, and endocarp (seed). Once the seed is removed, the shell becomes a waste if not being used (Djarkasi et al., 2007). Kenari shell has hardwood-liked-texture so that it can be used as raw material in production of liquid smoke. This was strengthened by Pearson and Tauber (1984) which stated that hardwood was the best raw material for fumigation. Subsequently, Girard (1992) also stated that the hardwood was commonly used because it produced scent which was rich in aromatic and acidic compounds.

The major compound that found in liquid smoke from hybrid coconut liquid smoke was 2,6-dimethoxyphenol (Tranggono et al., 2007) while 2-furancarboxaldehyde (furfural) was the major component of the liquid smoke from *Vitis venivera* L. (Kadir et al., 2010), *Fagus sylvatica* L. (Guillen and Ibargotia, 1996) and *Salvia lavandulifolia* (Guillen and Ibargotia, 1999). However, the composition of volatile compound from kenari shell and its application to meat has not been much known, thus, further investigation should be conducted.

Dilution of liquid smoke might change the quantity of the components and depended on the qualitative properties of the components. Presumably not all compounds were linearly affected by the dilution treatment, consequently the properties of the components were not known yet. Additionally, the application of kenari shell liquid smoke on the meat and the component penetrates into the meat had not been known. Thus, this study could give the quantitative and qualitative properties of the components of kenari shell liquid smoke and their composition of the component penetrates into the meat.

MATERIALS AND METHODS

Materials used were the kenari shell, which was obtained from Moti, Ternate, Maluku Utara, aquabides, H₂SO₄, hot water, KOH, CH₂Cl₂, cartridge Sep-Pak Florisil, Methanol, *longissimus dorsi* part of beef, 2-furanocarboxaldehyde, phenol, 2-methoxyphenol, 2,6-dimethoxyphenol, nitrogen gas, diethyl ether, and ice cubes.

Instrumentations applied in this research were , waterbath, desicator, oven, erlenmeyer, pyrolysis reactor, rotary evaporator (ika-Werke HB4 Basic which equipped with *vacuum evaporator Ikavac VC-2*), gas chromatography (GC) and gas chromatography-mass spectrometer.

Production of liquid smoke was done by pyrolysis, which was carried out at a temperature of 420°C for 100 minutes (Darmadji, et al., 2000). The obtained liquid smoke was centrifuged in 4000 rpm for 20 minutes (Kadir et al., 2010). The crude liquid smoke obtained was then analyzed to determine the amount of the volatile compound. The liquid smoke was subsequently diluted as much as 5 levels of dilution using aquabidest.

Analysis volatile compounds of liquid smoke-submerged-meat. Distillation and extraction were carried out simultaneously in a Likens-Nickerson (Lesimple et al., 1995). In a first flask, 100g of crushed meat was mixed with 300 mL of distilled water. A second flask was filled with 80 mL of diethyl ether. The two solutions were heated under reflux condition. Vapour was condensed in a reflux condenser. After the dehydration with Na₂SO₄anhydrous, the volume of solvent was reduced into a few mL under reduced pressure. Then extracts were dried under a gentle stream of nitrogen. The GC 6890N 5975B MSD with Agilent 19091s-433 HP-5MS 5% phenyl methyl siloxane capillary column (30 m long, 0.25 mm diameter) was used.

RESULTS AND DISCUSSION

Gas chromatography chromatograms of meat that submerged in liquid smoke could be seen in Figure 1. Gas chromatography chromatograms of meat that submerged in liquid smoke could be seen in Figure 1. Components detected in samples of meat were about 17 volatile compounds and 2 solvent. The number of volatile compounds that could be detected on raw amoke-meat was 17 compounds (1 acetic acid, 10 carbonyl and 6 phenolic).

In Figure 1a, No peak except solvent peak which was detected in meat sample without the addition of the liquid smoke (control), whereas in Figure 1 b-f, 17, 12, 10, 10, and 3 volatile compounds were detected in the meats that submerged in liquid smoke of 1X, 2X, 3X, 4X and 5X dilution, respectively. The major components of the liquid smoke-submerged-meat were furfural and guaiacol. All volatile compounds that accumulated in the liquid smoke-submerged-meat were also detected in liquid smoke, except 2-methoxy-6-mehtylphenol.

This indicated that the submersion of meat in kenari shell liquid smoke led the penetration of the components of liquid smoke into the meat. The amount of volatile compounds tended to decrease with the increasing of the dilution levels. The amount liquid smoke penetrated into food depended on solution concentration and duration of submersion (Hadiwiyoto et al., 2000). Different amount of the compounds obtained, showed that each compound had different diffusion properties into meat. This was caused by the differences in the size of the compounds. Hadiwiyoto et al. (2000) reported that the amount of phenol in smoked fish ± 1/10-1/40 from total phenol of liquid smoke.

The effect of dilution to the amount of furfural, phenol, 2-methoxyphenol (guaiacol), and 2,6-dimethoxyphenol (syringol) was 67,0; 81,8; 84,3 and 24,3%, respectively. The amount of phenol was considered to be dangerous to life or health if it reached 100 ppm (Anonymous.

2005). Based on that information, smoked meat samples could be considered to be safe for healthy, i.e. from the level of phenol.

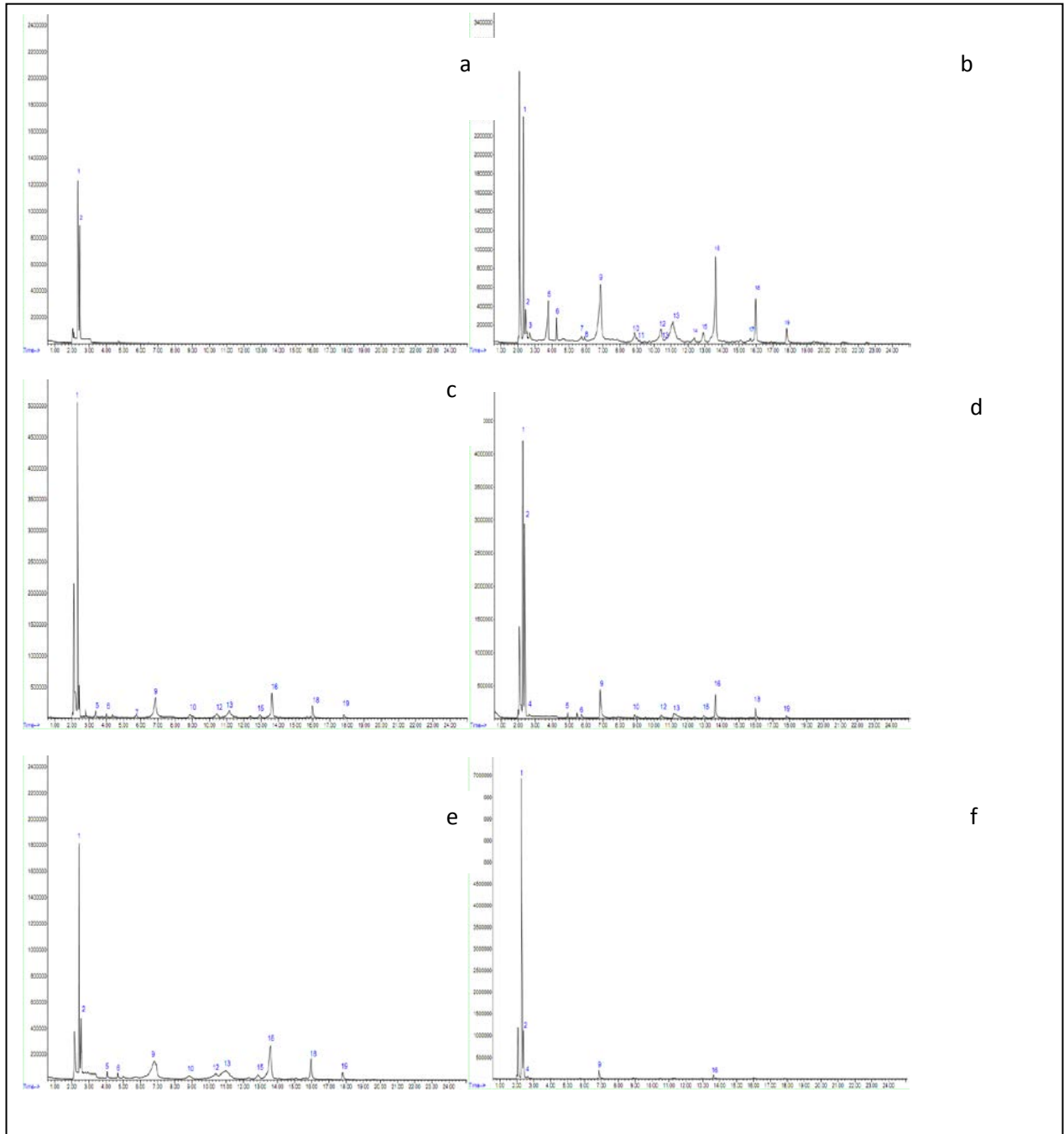


Figure 1. Chromatograms of meat samples without smoke/control (a) submerged in kenari shell liquid smoke 1X (b) 2X (c) 3X (d) 4X (e) and 5X (f) dilutions

IMPLICATIONS

The number of volatile compounds that could be detected on raw amoke-meat was 17 compounds (1 acetic acid, 10 carbonyl and 6 phenolic). It was proven that liquid smoke of kenari shell could serve as developer of meat flavor. The major components of the raw smoke-meat were furfural and guaiacol.

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