ANALYTICAL LABORATORY APPROACHES FOR NUTRIEN, FOOD SAFETY AND HALAL PRODUCTS

Sayekti Wahyuningsih, Laboratorium MIPA Terpadu, Faculty of Mathematic and Natural Science, Sebelas Maret University, Ir. Sutami Street 36A Kentingan Surakarta

Coresponding: sayekti@mipa.uns.ac.id

ABSTRACT

Food safety is food that does not cause harm to the consumers when it is prepared and/or eaten according to its intended use. In order to assure the food is safe the food producers should take necessary steps to comply with Good Manufacturing Practice (GMP) and Good Hygiene Practice (GHP). Food can be contaminant by chemical hazard, physical hazard and biological hazard. Chemical can be very harmful if they are spit on near food, mistaken for or drink, quality issues or product failures, such as presence of toxic substances, flavors/colors additive, contamination and packing failures such as packaging deterioration, contamination or seal failure or contamination. Analytical laboratory approaches need to be done to know chemically additive substance may contain in the food products. Food additive analysis was done using analytical method include spectroscopy analysis, chromatography as well as physical and biological technique. Combination of spectroscopy and chromatography equipment can elucidate the structure of food additive compounds clearly. Optimization is necessary in this case by means of the selection methods, and the selection of appropriate mobile phase in separation process. Developments subsequent analysis of foodstuffs requires biology and physics laboratory, respectively. Analysis based on the reaction between antigens and antibodies by ELISA analysis help determine the specific content of the protein in pigs that are able to detect contaminant content of pork in processed foods. If we are concerned with the analysis of halal products, the analytical methods in university laboratory must be improved. For example, that difference in meat beef, lamb and pork can be reviewed on the content of fatty acids.

Keywords: *Food safty, food additive, halal products*

Introduction

Safe food is food that does not cause harm to the consumers when it is prepared and/or eaten according to its intended use. In order to assure the food is safe the food producers should take necessary steps to comply with Good Manufacturing Practice (GMP) and Good Hygiene Practice (GHP). Good Manufacturing Practice is where the producers apply the combination of manufacturing and quality control procedures to ensure the products are consistently manufacture d to the specifications. For food safety, we need to avoid preparing food when or feeling unwell, keep raw meat, poultry and seafood separation from cooked food and food to be eaten raw, protect food in the refrigerator, use clean equipment, plate or containers to prevent contamination of cooked food, use clean equipment, rather than hand to pick up food and always wash fruit and vegetables to be eaten raw under running water. Whereas, food hygiene is important to be applied by food producers in order to provide foods that are safe and suitable for consumption. They also need to ensure that consumers are provided with clear and easily understood information - by way of labeling or other appropriate means - on storage, handling and preparation of the food. This will prevent food from contamination from food borne pathogens. Food hygiene practice should apply throughout the food supply chain from primary production through to final stage for consumption; setting out the key hygienic controls and conditions at each stage of production. Consumers on the other hand should recognize their role by following relevant instructions and applying appropriate food hygiene measures.

Food can be contaminat by chemical hazard, physical hazard and biological hazard. Keep cold food cold and hot food hot is a way to keep food retended by microbial. Illness from costuming food that contains a harmful substance, harm microorganisms or their toxins. Chemicals in the home include those used: to clean kitchen surfaces and equipment as pesticides. Chemical can be very harmful if they are spit on near food, mistaken for or drink, quality issues

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or product failures, such as presence of toxic substances, flavors/colors additive, contamination and packing failures such as packaging deterioration, contamination or seal failure or contamination. Analytical laboratory approaches need to be done in this case.

Analytical laboratory approaches to food safety and halal products

Analytical laboratory approaches need to be done to know chemically additive substance may contain in the food products. Food additives are substances added to food during processing or storage for a variety of purposes. They include enrichment agents for increased nutrient level, coloring agents for enhanced appearance, taste agents for better taste, and preservative agents for improved storage stability.

Food additive analysis was done using analytical method include spectroscopy analysis, chromatography as well as physical and biological technique. High Performance Liquid Chromatography (HPLC) in conjunction with COSMOSIL ODS and specialty columns offer improved separation for a large variety of food additives. Enrichment agents can be divided into three groups; vitamins, minerals and amino acids. It is difficult to separate amino acids by a C18 column Coloring agents can be divided into two groups; synthetic and natural coloring agents. Most of them can be separated by C18 columns due to their high hydrophobicity. Coloring agents can be divided into two groups; synthetic and natural coloring agents. Most of them can be separated by C18 columns due to their high hydrophobicity. Taste agents for sweetness, sourness, saltiness, bitterness or savoriness can be separated by C18 columns.

Epoxy application by cross sectional study and film thickness can be investigated by microscopy. It used modulated differential scanning calorimetric to investigate inadequate epoxy curing and then used GC/MS for solvent extraction, Fourier transform infrared (FTIR) spectroscopy and surface analysis with energy dispersive X-ray analysis to inspect possible contamination. Sulfur detection on the control metal surface and the suspect metal surface was

calculated using Energy dispersive X-Ray (EDX) or X-ray Fluorescence Spectroscopy (XRF). Food additives are substances added to food as preservatives, antioxidants, emulsifiers, etc. Recent increase in consumption of processed foods has introduced more additives. Securing food safety demands determination of these additives. Table below list the result of method for test selected product analyte content in variety food production.

Product analyte	Testing method
Diatery supplement	
Theobroma cocoa (theobromine, theofiline, coffein)	HPLC
Anthocyanin	HPLC
Garlic (allicin)	HPLC
Gingseng	HPLC
Green tea Chatechin	HPLC
Isoflavon (gycitein, Glicitin)	HPLC
Marine lipid	GC
Omega-3 fatty acid	GC
PABA (paraamino benzoic acid)	HPLC, LCMS
Polyphenol total polyphenol	Vis Spectroscopy
Rose hips (ascorbic acid)	HPLC
Royal Jelly 10-HAD (10-hydroxy-decanoic acid)	HPLC
Colour	
E102,E110,E124,E127andE133)	Colunm Chromatography
Sweeterners	
acesulfame-K, aspartame, saccharin, cyclamate	HPLC, spectroscopy
Preservative	
Sorbic acid, benzoic acid	HPLC, GC MS, Specroscopy
Sulphite, nitrite, nitrate	Spectroscopy-colorimetry, HPLC
Metal content (Al, Fe, Cd, Pb, Cu, Ni)	AAS, Vis Spectroscopy, ICP
Alfatoxin	HPLC
Gelatin	HPLC
Fatty acid	HPLC, IR spectroscopy
TAG	HPLC – LCMS

Identification and separation of food additives sometime need complicated preparation

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based on food additive content. Dietary supplement sweeteners and preservative can found in the one sample. Chromatograms from the analysis of the standard solution show the characteristic Rf (min) of the standard solution of food additive. Analysis of food additives with UV-Vis spectrophotometer can be done either by qualitative and quantitative methods. This method is based on the absorption of organic compounds specific food additives. Quantitative analysis can be done by comparing the absorbance of the analyte with a standard solution whose concentration is obvious. However, this method can not distinguish organic structure is clearly similar, as is the case in mass spectroscopy. Combination of spectroscopy and chromatography equipment can elucidate the structure of food additive compounds clearly. Developments subsequent analysis of foodstuffs requires proof biology and physics laboratory.

Naturally Occuring Chemicals hazard, e.g. aflatoxin, have unique mass spectra from LCMS, or UPLC MS/MS allow positive identification of structurally similar alfatoxins (Fig.1 and Fig.2 result)

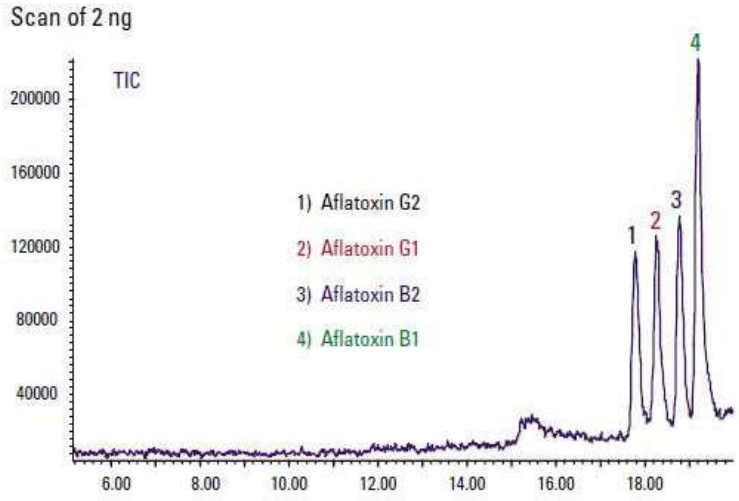

Figure 3. Total ion chromatogram of a mixture of aflatoxins

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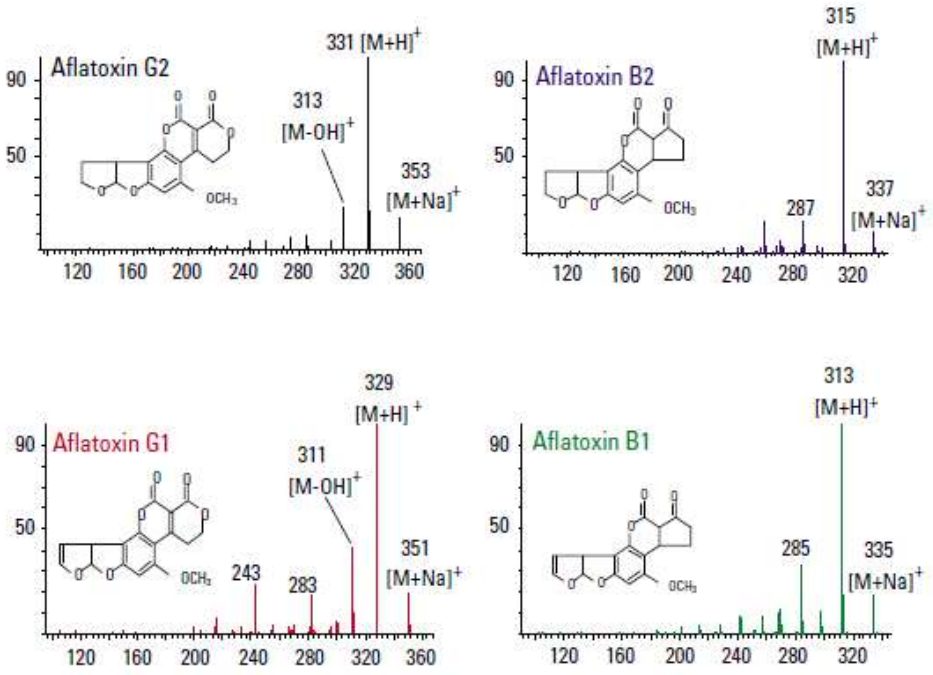

Figure 4. Mass Spectra of similary structure of Alfatoxin
(Basic LCMS, Agilent Technologies, 2001)

Adulteration with vegetable fats and oils can be detected by several thin layer chromatographic techniques while animal body fat adulteration is more difficult to detect (Lambelet, 1983). In some countries, food manufacturers choose to blend vegetable oil with lard to reduce production cost because lard is the cheapest fat currently and commonly available for the food industries. Lard or industrially modified lard could be effectively blended with other vegetable oils to produce shortenings, margarines and other speciality food oils (Marikkar, Lai, Ghazali, & Che Man, 2002). Pork and lard in food are serious matters in view of religious concerns, biological complication and health risks associated with daily intake (Rashood, Abdel-Moety, Rauf, Abou Shaaban, & Al- Khamis, 1996). From a religious point of view, Islam, Judaism and Hinduism prohibit their followers from consuming any foods containing porcine ingredients (Al-Qaradawi, 1995). If we are concerned with the analysis of halal products, the

analytical methods must be improved. For example, that difference in meat beef, lamb and pork can be reviewed on the content of fatty acids. Pork contains 18:2 n-6 linoleic highest (ie 14.2%, whereas 2.4% on beef and lamb 2.7%). This is a good example for distinguishing reference of some kind of meat on the market. FTIR spectroscopy, combined with ATR and PLS regression, can be used to determine the lard content when blended with cocoa butter (Che Man, et al., 2005). Lard, one of the pig derivatives, lis deliberately added into the food products to reduce the production cost (Che Man and Sadzili, 2010). From the religious point of view, the presence of lard in any food products is not allowed. Lard can be differentiated based on its TAG composition in which the level of palmitooleoolein (POO), palmitooleostearin (POS), and palmitoolepalmitin (POP) were predominantly present compared with other TAGs. In lard, these TAGs composed for 21.55 ± 0.08, 14.08 ± 0.04, and 5.10 ± 0.04%, respectively (Rohman et al., 2012).

Gelatin is one of the most widely used food ingredients. Its applications in food industries are very broad including enhancing the elasticity, consistency and stability of food products. Gelatin is also used as a stabilizer, particularly in dairy products (Gimenez, Gormez-Guillen and Montero, 2005) and as a fat substitute that can be used to reduce the energy content of food without negative effects on the taste (Riaz and Chaudry, 2004). Most commercial gelatin is currently sourced from beef bone, hide, pigskin and, more recently, pig bone. It was reported that 41% of the gelatin produced in the world is sourced from pig skin, 28.5% from bovine hides and 29.5% from bovine bones (Hayatudin, 2005). The amino acids compositions of the gelatins were determined on a amino acid auto analyser high performance liquid chromatography equipped with the amino acid analyzing software. Analysis based on the reaction between antigens and antibodies by ELISA analysis help determine the specific content of the protein in pigs that are able to detect contaminant content of pork in processed foods. ELISA is a technique that uses

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antibodies to isolate a compound of interest, then combined with radioactivity or enzyme-based colour changes (Enzyme-linked immunosorbant assay- ELISA) to measure amount of compound in the sample.

In order to determine any potential risk from food additives ingestion, accurate analytical information and consumption data are required. Unfortunately, there are relatively few sources of published analytical information concerning the determination of the content levels of these food additives in foodstuff products consumed in Indonesia. Criteria for selecting an analytical technique precision are including accuracy reproducibility, simplicity, cost, speed, sensitivity, specificity, safety, destructive/ non-destructive, on-line/off-line, and official approval.

Conclusion

Analytical laboratory approaches need to be done to know chemically additive substance may contain in the food products. Food additive analysis was done using analytical method include spectroscopy analysis, chromatography as well as physical and biological technique. Combination of spectroscopy and chromatography equipment can elucidate the structure of food additive compounds clearly. Optimization is necessary in this case by means of the selection methods, and the selection of appropriate mobile phase in separation process.

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