OPEN ACCESS
Eurasian Journal of Analytical Chemistry
ISSN: 1306-3057
2017 12(2):45-59
DOI 10.12973/ejac.2017.00153a

Molecular Products and Particulate Characterization of Emissions from High Temperature Cooking of Goat Meat

Nicholas Rono
Egerton University, KENYA
Joshua Kibet
Egerton University, KENYA
Francis I. Okanga
Egerton University, KENYA
Samuel C. Limo
University of Eldoret, KENYA

Received 25 February 2016 ▪ Revised 10 April 2016 ▪ Accepted 18 April 2016

ABSTRACT
Efforts to understand the formation characteristics of molecular toxins and particulate matter from various combustion systems, has gained intense attention in the recent past. Accordingly, this work investigates the evolution of organic toxins and particulate matter from a goat meat sample at various pyrolysis temperatures. To simulate cooking conditions, 10 mg of meat sample was heated under atmospheric conditions in an air depleted environment in a thermal degradation reactor and the smoke effluent passed through a transfer column and collected over 10.0 mL dichloromethane for GC-MS analysis. The major selected toxins reported in this study include indole, 2-(1-methyl) quinoline, phenol, 2-ethylthiophenol, 2,3-dimethylhydroquinone, and 1,1'-biphenyl. At the highest pyrolysis temperature (700 ˚C), the mean particle size of particulate emissions was estimated to be 7.72 ± 0.61 µm while at 500 ˚C, the particle size of emissions was found to be 3.52 ± 0.31 µm. The decomposition profile of meat was monitored between 300 and 525 ˚C, and the highest mass loss was recorded between 300 and 450 ˚C (~ 36%). Most of the organic toxins from high temperature cooking of goat meat were mainly phenolics whereas the particulate emissions at 500 ˚C and 700 ˚Cwere approximately $PM_{2.5}$ and PM_{10} respectively.
Keywords: molecular toxins, scanning electron microscopy, pyrolysis, particulate matter

INTRODUCTION

Although many studies have been conducted on the thermal degradation of various biomass materials, few studies have been investigated on the combustion of goat meat at high cooking temperatures. In this regard, the concept of potentially toxic by-products from various combustion sources has attracted interest because of the health and environmental impacts induced by organic toxins [1, 2]. For instance, many extremely mutagenic heterocyclic amines have been proven to be multi-site tumor initiators in long-term animal studies such as

Correspondence: Joshua Kibet, *Department of Chemistry, Egerton University, P.O Box 536-1125, Egerton, Kenya.*
jkibet@egerton.ac.ke