MICROBIOLOGY INDONESIA
ISSN 1978-3477

Volume 3, Number 3, December 2009
p 146 - 150

SHORT COMMUNICATION

Antimicrobial Activity of Black Cumin Extracts (*Nigella sativa*) Against Food Pathogenic and Spoilage Bacteria

SEDARNAWATI YASNI[1*], ELVIRA SYAMSIR[1] AND EVA H DIREJA[2]

[1]*Department of Food Science and Technology, Institut Pertanian Bogor, Darmaga Campus, PO Box 220, Bogor 16002, Indonesia*
[2]*Flavor Applicator, PT Jerindo Sari Utama, Jalan Cempaka Putih Raya C-20, Jakarta 10510, Indonesia*

This study aimed to analyze the antimicrobial activity of black cumin (*Nigella sativa*) extracts in inhibiting the growth of pathogenic and spoilage bacteria. Black cumin was extracted by using steam distillation, single solvent extraction, and continuous solvent extraction. Ethanol extract was the best extract in inhibiting the growth of bacteria while both aqueous and hexane extracts were less effective as antimicrobial agents. Ethanol extract, essential oil, and ethyl acetate extract have a broad antimicrobial spectrum. The chemical composition of the essential oil was analyzed using a GC-MS technique. The major component of black cumin essential oil was para-cymene, followed by trans-anethole, alloaromadendrene, á-thujene, and thujyl alcohol along with many other components in minor amounts. The Minimum Inhibitory Concentration (MIC) value of ethanol extract in inhibiting the growth of *Salmonella typhimurium* was 0.084% (w/w), of essential oil in inhibiting the growth of *Bacillus cereus* was 1.72% (w/w), of ethyl acetate extract in inhibiting the growth of *Staphylococcus aureus* was 1.88% (w/w) and of methanol extract in inhibiting the growth of *Pseudomonas aeruginosa* was 1.88% (w/w).

Keywords: antimicrobial activity, extract, *Nigella sativa*, pathogenic bacteria, spoilage bacteria

Food and waterborne diseases are the leading causes of illness and death in developing countries. One strategy to reduce food-borne illness is by addition of antimicrobial food preservatives during the processing stage to inactivate or prevent the growth of microbes (Thongson *et al*. 2004). Since people awareness towards healthy living has changed their mind back to nature, this encourages many researches to pursue natural potensial including research on new antimicrobial compound from nature.

Black cumin (*Nigella sativa*) is a herbaceous plant, whose seeds have been used for centuries to treat various ailments, including infectious diseases, and which posesses several medicinal properties (Ali and Blunden 2008; Randhawa and Al-Ghamdi 2002). In Middle East, black cumin seeds are used as traditional medicine to treat some health problems, and are also usually added to the traditional food, mixed with bread or honey to increase its flavor (Al-Saleh *et al*. 2006). In Indonesia, black cumin seed locally known as Jintan Hitam is used to treat diarrhea and hypertension. Diarrhea is one of the most frequent diseases that is caused by microbial contamination. Thus, it is assumed that black cumin has antimicrobial activity, and the aim of this study is to analyze the antimicrobial activity of the crude extracts of black cumin seeds on several bacteria.

Sample material used in this research was black cumin seeds purchased from Pasar Tanah Abang Jakarta, and have been reidentified by Herbarium Bogoriensis in Bogor. Powdered sample of black cumin was obtained by milling the dried black cumin seeds with blender and filtered (20-40 mesh). The powdered sample was stored at a room temperature in desiccator with plastic packaging until use. Technical grade of hexane, ethyl acetate, methanol, pure analysis of dimethyl sulphoxide (DMSO) and ethanol 96% were purchased from CV. Panca Pratama Bogor. The bacteria were obtained from Balivet Culture Collection (BCC), Balai Penelitian Veteriner – Institut Pertanian Bogor, such as *Staphylococus aureus* BCC 1798, *Escherichia coli* (BCC 207), *Salmonella typhimurium* BCC 712, *Pseudomonas aeruginosa* BCC 1993 and *Bacillus cereus* BCC 2186. Tested bacteria were prepared in 10 mL nutrient broth media, incubated aerobically at 37°C for 24 h. The tested-bacteria culture (10^5 cfu mL^{-1}) was used in the antimicrobial activity test of various extracts of black cumin. The extracts were diluted with DMSO which has the ability to dilute polar and non-polar compounds, and has emulsifier and non-toxic properties.

Aqueous extract and ethanol extracts were obtained through single extraction by reflux method. The extraction process was conducted with the ratio of material to solvent 1:3 for 3 h at 100°C for distilled water and at 70°C for ethanol. At the end of extraction each extract was passed through Whatman filter paper No.1. After filtration, the residue was re-extracted for 2 h using an additional volume of solvent with the same ratio of 1:3 and then filtered. The combined filtrate was concentrated by rotary evaporator at 40-45°C for ethanol extract. Water is difficult to be vaporized so aqueous extract was not concentrated, but water content of aqueous extracts was analyzed using isotropic method (AOAC 2005).

Essential oils were obtained by steam distillation which was conducted by Balai Tanaman Rempah and Obat (Spice and Medicine Centre), Bogor. The residue obtained from steam distillation was utilized as sample for continuous extraction. The chemical composition of the essential oils

*Corresponding author. Tel. +62251-8626725/8356889; Fax+62251-8626725; Email: sedarnawati@yahoo.com