



Antibacterial and antispore activities of crude extract and bioactive compounds of *Piper cubeba* L. berries against *Bacillus* sp. and application of the extract for food preservation

Fatimah Alqadeeri 1,3, Y. Rukayadi 1,2,, F. Abbas 1,2 , K. Shaari 1

¹Laboratory of Natural Products, Institute of Bioscience, University of Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

²Department of Food Science, Faculty of Food Science and Technology, University of Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

³Department of Botany, Faculty of Science, University of Sabratha, Sabratha, Libya

Abstract:

In the food industry, the *Bacillus* species, in particular, is known as organisms that cause foodborne diseases and food spoilage. *Bacillus* species are produce of spores and many of the spores of the *Bacillus* species have been shown to be resistant to heat, radiation, and disinfectants. A previous study has shown that crude extracts of tailed pepper (*Piper cubeba* L.) have potential antimicrobial activities against some of *Bacillus* species. The present study aims to analyze the antibacterial and antispore activities of *Piper cubeba* L. berries extracts on the vegetative cells and spores of *Bacillus cereus* ATCC33019, *B. subtilis* ATCC6633, *B. pumilus* ATCC14884, and *B. megaterium* ATCC14581. Results showed that exposing of *Bacillus* sp. to *P. cubeba* L. extract and its compounds resulted in an inhibition zone with a large diameter which ranged between 9.50 to 11.40 mm for the extract and 7.21 to 9.61 mm for the compounds. The MIC of the extract ranged between 0.156 – 0.313 mg/mL and the MBC at 2.5 mg/mL. Moreover, for the compounds the MIC range was between 63.0 to 125.0 µg/mL and MBC at 250.0 to 500.0 µg/mL against *Bacillus* sp. The time-kill curve plots showed that exposing *Bacillus* sp. to a concentration of 8× MIC for a period of four hours resulted in the death of all cells. The values of MIC and MBC showed a fluctuating trend when the bacteria were exposed to *P. cubeba* L. extract treated with different temperature in comparison to untreated extract. Generally, the pH altered extracts caused a variation in the MIC and MBC values of the *Bacillus* sp. The effect of using varying concentrations of extracts and compounds against the *Bacillus* sp. spores for varying periods of incubation were determined. Glutaraldehyde, which is a chemical sporicidal agent, was used as a positive control. *P. cubeba* L. extract at a concentration of 1.0% inactivated more than 3- Log₁₀ (90.99%) of the *Bacillus* sp. spores after an incubation period of four hours, and all the spores were killed at a concentration of 2.5%. The image of scanning electron microscope showed that the structure of spores were destroyed after treatment with 1% *P. cubeba* L. extract for one hour. The major volatile compounds, as determined using GC-MS, are β -cubebene, cubebol, β -copaene, β -cubebene, caryophyllene, 9,12-octadecadienoic acid, β -asarone, and germacrene-D. The non-volatile compounds identified through LC-MS are gallic acid, quinic acid, asaronaldehyde, epicatechin, clusin, cubebinolide, hemiarensin, β -asarone, hinokinin, ellagic acid, myricetin, and β -cubebene. The iden-



tified phytochemical compounds are similar with those in the literature and MS/MS databases. β -Asarone, asaronaldehyde, cubebin mixture and linoleic acid were successfully isolated and identified from the methanol extract of *P. cubeba* L. In general, a decrease of 3 Log₁₀ of *Bacillus* sp., total plate count, *E. coli* and coliform bacteria on the tofu sample was observed when these bacteria were exposed to 0.50% (v/v) *P. cubeba* L. extract. In conclusion, *P. cubeba* L. extracts and its compounds show a promising potential of antibacterial and sporicidal activities against the *Bacillus* sp. and thus can be developed as an anti-*Bacillus* agent.

Biography:

Dr. Fatimah Alqadeeri, was born on 11 March 1979 at Benghazi, Libya. She studied the primary and secondary schools in her city during the period from 1985 to 1997. In 1998 she did her bachelor degree at Benghazi University Sciences Faculty. She graduated in 2001 and obtained a Degree in Botany. She worked for nine years in a secondary school as a teacher. In April 2008 she studied in Academy of Libya University Sciences Faculty Botany field. In 29 December 2010 she obtained the degree of Master. She worked for four years in Sciences Faculty at Zawia University as a lecturer. In first of May 2015 she came to Malaysia and studied English in Malvern College, Kuala Lumpur for five months. In October 2015 she studied English in ELS School, Kuala Lumpur for two months and got Ielts certification. In October 2019 she obtained the doctor of philosophy in microbial biotechnology. She published 2 papers first one was in *Molecules* on 2019 and second in *Food Research*.

Publication of speakers:

1. Kim, B., Bang, J., Kim, H., Kim, Y., Kim, B.-s., Beuchat, L.R. and Ryu, J.-H. (2014). *Bacillus cereus* and *Bacillus thuringiensis* spores in Korean rice: Prevalence and toxin production as affected by production area and degree of milling. *Food Microbiology*, 42(0): 89-94.

Emerging Trends in Plant Science and Natural Products Research, March 19-20, 2020; London, UK

Citation: Fatimah Khalleefah Alqadeeri; Antibacterial and antispore activities of crude extract and bioactive compounds of *Piper cubeba* L. berries against *Bacillus* sp. and application of the extract for food preservation; *Natural Products* 2020; March 19-20, 2020; London, UK