FUNGAL CONTAMINATION OF SPICES USED IN LOCAL MALAYSIAN CUISINES

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by

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A dissertation submitted in the partial fulfilment of the requirements for the degree of Bachelor of Technology (B.Tech) in the field of Food Technology.

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DECLARATION BY AUTHOR

This dissertation is composed of my original work and contains no material previously published or written by another person except where due reference has been made in the text. The content of my dissertation is the result of work I have carried out since the commencement of my research project and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution.

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LIST OF ABBREVIATIONS

ADM	*Aspergillus* Differentiation Medium
AFs	Aflatoxins
BPW	Buffered peptone water
CFU	Colony forming units
CYA	Czapek Yeast Autolysate
DG18	Dichloran-glycerol Agar
MEA	Malt Extract Agar
OTA	Ochratoxin A
PDA	Potato Dextrose Agar

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PENCEMARAN KULAT DALAM REMPAH YANG DIGUNAKAN DALAM MASAKAN TEMPATAN DI MALAYSIA

ABSTRAK

Rempah ratus banyak digunakan dalam pelbagai masakan di Malaysia untuk meningkatkan rasa dan aroma makanan. Walau bagaimanapun, rempah ratus terdedah kepada jangkitan kulat kemudian pencemaran mikotoksin sekiranya kaedah penyimpanannya sesuai untuk pertumbuhan kulat. Oleh itu, kajian ini bertujuan untuk menentukan kelaziman kulat mikotoksigenik dalam rempah yang digunakan dalam masakan tempatan Malaysia dan untuk mengenalpasti spesies-spesies kulat berdasarkan ciri-ciri morfologi. Sebanyak 48 sampel yang terdiri daripada serbuk rempah dan rempah penuh telah dibeli secara rawak di pasar runcit di Pulau Pinang. Tahap pencemaran oleh kulat di dalam serbuk rempah dan rempah penuh masing-masing ditentukan dengan menggunakan kaedah pencairan dan kaedah langsung. Berdasarkan penemuan daripada kaedah langsung, jintan putih (4.0×10^3 CFU/g) mencatatkan jumlah kulat tertinggi, diikuti dengan lada hitam (3.6×10^3 CFU/g) dan biji ketumbar (3.3×10^3 CFU/g). Sementara itu, jangkitan kulat tertinggi untuk rempah penuh ialah biji ketumbar (91%) diikuti oleh lada hitam (90%) dan lada putih (87%). Sebaliknya, bunga lawang dan cengkeh bebas daripada pencemaran kulat. *A. niger* adalah spesies utama yang terdapat dalam serbuk campuran kurma dan serbuk kari dengan kekerapan pengasingan ialah masing-masing sebanyak 72% dan 65%. *A. niger* digambarkan sebagai koloni hitam dengan miselium yang tidak ketara pada Czapek Yeast Autolysate (CYA) dan Malt Extract Agar (MEA). Selain itu, *A. carbonarius*, *A. chavelieri*, dan *A. tamarii* juga diasingkan dari rempah ratus yang lain seperti lada hitam dan biji ketumbar dengan kekerapan pengasingan yang lebih rendah. *A. niger* adalah kulat mikotoksigenik yang

biasanya menghasilkan okratoksin A, dan ia diklasifikasikan sebagai karsinogen yang berpotensi kepada manusia (Kumpulan 2B). Penemuan ini mungkin menunjukkan risiko pendedahan okratoksin kepada pengguna kerana rempah ratus biasanya digunakan dalam pelbagai masakan tempatan di Malaysia.

FUNGAL CONTAMINATION OF SPICES USED IN LOCAL MALAYSIAN CUISINES

ABSTRACT

Spices are widely used in various cuisines in Malaysia to enhance the flavour and aroma of the cuisines. However, spices are susceptible to fungal infection and subsequent mycotoxin contamination if the storage conditions are favorable for the fungal growth. Thus, this study aimed to determine the prevalence of mycotoxigenic fungi in spices used in Malaysian local cuisines and to identify the species based on morphological characteristics. A total of 48 samples that consist of ground spices and whole spices were purchased randomly at the retail market in Penang. The level of fungal contamination in ground and whole spices were analyzed using dilution plating method, and direct plating method, respectively. Based on the direct plating results, cumin (4.0×10^3 CFU/g) recorded the highest total fungal load, followed by black pepper (3.6×10^3 CFU/g) and coriander seed (3.3×10^3 CFU/g). Meanwhile, the highest incidence of fungal infection for the whole spices was recorded by coriander seed (91%) followed by black pepper (90%) and white pepper (87%). In contrast, star anise and cloves were free from fungal contamination. *A. niger* was the predominant species found in *kurma* mix and curry powder with the isolation frequency of 72% and 65% respectively. *A. niger* is described as black colonies with inconspicuous mycelium on Czapek Yeast Autolysate (CYA) and Malt Extract Agar (MEA). In addition, *A. carbonarius, A. chavelieri, and A. tamarii* were also isolated from other spices such as black pepper and coriander seeds with lower isolation frequency. *A. niger* is the most common mycotoxigenic fungi that produce ochratoxin A, which is classified as a potential human carcinogen (Group 2B). These

findings might indicate the risk of ochratoxin exposure to the consumers since spices are commonly used in various local cuisines in Malaysia.