MICROBIOLOGICAL CONTAMINATION OF KERABU DISHES SOLD AT CAFES AND FOOD STALLS IN UNIVERSITI SAINS MALAYSIA

by

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Saya telah menyemak semua pembetulan/pindaan yang dilaksanakan oleh Encik/Puan/Cik NORSYAHIRA BINTI 'ASRI mengenai disertasinya sebagaimana yang dipersetujui oleh Panel Pemeriksa di *Viva Voce*-nya.

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Sekian, terima kasih.

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DECLARATION BY AUTHOR

I hereby declare that this dissertation is solely my original work, and contains no material from other authors published unless due to the reference made in the text. This result in this dissertation is coming from my work which I carried out during my final year project which is needed to be submitted to qualify for the award of any degree or diploma in any university or other tertiary institution.

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LIST OF ABBREVIATIONS

BAM	Bacteriological Analytical Manual
BPA	Baird Parker Agar
BGLB	Brilliant Green Lactose Bile
BPW	Buffered Peptone Water
CFU	Colony Forming Unit
DRBC	Dichloran Rose Bengal Chloramphenicol Agar
EAEC	Enteroaggregative *Escherichia coli*
EHEC	Enterohemorrhagic *Escherichia coli*
EIEC	Enteroinvasive *Escherichia coli*
EPEC	Enteropathogenic *Escherichia coli*
ETEC	Enterotoxigenic *Escherichia coli*
FDA	Food and Drug Administration
L-EMB	Levin Eosin Methylene Blue
LIA	Lysine Iron Agar
LST	Lauryl Sulphate Tryptose
MKKTn	Muller Kauffman Tetrathionate-novobiocin
MPN	Most Probable Number
PCA	Plate Count Agar
PDA	Potato Dextrose Agar
RTE	Ready-To-Eat

RV	Rappaport-Vassiliadis
TNTC	Too Numerous To Count
TPC	Total Plate Count
TSI	Triple Sugar Iron
XLD	Xylose-Lysine Deoxycholate
XLT4	Xylose-Lysine Tergitol 4

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KONTAMINASI MIKROBIOLOGI DALAM HIDANGAN KERABU DIJUAL DI KAFE DAN MEDAN SELERA DI DALAM UNIVERSITI SAINS MALAYSIA

ABSTRAK

Kerabu adalah hidangan yang terdiri daripada pelbagai bahan sebelum dicampurkan bersama tanpa memerlukan proses memasak. Dengan bahan yang terdiri daripada kebanyakannya buah-buahan dan sayur-sayuran, kerabu biasanya disediakan segar sebelum dimakan. Tidak mempunyai rawatan memasak, hidangan ini mempunyai hayat simpanan yang terhad dan kerana faktor ini, keselamatan hidangan ini dapat dipersoalkan kerana tiada proses yang digunakan untuk mengurangi bilangan mikrobial. Kajian ini dijalankan untuk mengkaji kelaziman mikroorganisma yang mungkin ada di kerabu RTE (sedia untuk dimakan) di kafe dan gerai makanan di dalam dan sekitar Universiti Sains Malaysia (USM), Pulau Pinang. Sebanyak dua puluh sampel kerabu telah dikumpul dan dicerakinkan dengan pelbagai analisis iaitu jumlah kiraan plat (TPC), jumlah yis dan kulat, koliform dan pengesanan *Escherichia coli*, *Salmonella* spp. dan *Staphylococcus aureus*. Hasil kajian menunjukkan bahawa untuk TPC kebanyakan sampel melebihi 10^7 CFU/g dengan nilai tertinggi adalah dari sampel 6 (kerabu taugeh) dengan $4.68x10^8$ CFU/g, sementara yis dan kulat dengan jumlah pengesanan juga melebihi 10^7 CFU/g dengan $1.78\ x10^8$ CFU/g iaitu dari sampel 2 (kerabu taugeh). Lima sampel mencatatkan nilai CFU/g tertinggi iaitu lebih dari 1100 MPN/g untuk coliform fekal dan dua sampel positif untuk *Escherichia coli* yang merupakan sampel 1 (kerabu mangga) dan sampel 3 (kerabu taugeh). Satu sampel disahkan telah dicemari oleh *Salmonella* iaitu sampel 4 (kerabu mangga). Daripada hasil kajian, dapat disimpulkan bahawa RTE kerabu menjadi salah satu punca pencemaran makanan, justeru langkah berjaga jaga perlu diambil untuk mengelakkan wabak bawaan makanan.

MICROBIOLOGICAL CONTAMINATION OF KERABU DISHES SOLD AT CAFES AND FOOD STALLS IN UNIVERSITI SAINS MALAYSIA

ABSTRACT

"Kerabu" is a salad dish that is made up of multiple ingredients before they are mixed together without having any heat treatment for cooking. With the ingredients consisting of mostly fruits and vegetables, this dish is usually prepared fresh before being consumed. Having no cooking treatment, making this salad has a limited shelf life and due this factor, the safety of this dish can be questioned as there is no process used to reduce the microbial load of the dish. This study was conducted purposely to investigate the prevalence of microorganisms that are possible to be present in (ready-to-eat) RTE "kerabu" in cafes and food stalls in Universiti Sains Malaysia (USM), Penang. Twenty "kerabu" samples were collected and been analyzed for various analyzes which were total plate counts (TPC), yeast and mold count, total and fecal coliform and detection of *Escherichia coli*, *Salmonella* spp. and *Staphylococcus aureus.* Results showed that for TPC of the most of the samples were more than 10^7 CFU/g with the highest values was from sample 6 (kerabu taugeh) with $4.68x10^8$ CFU/g, while yeast and mold with detection count also were more than 10^7 CFU/g with $1.78x10^8$ CFU/g from sample 2 (kerabu taugeh). Five samples were recorded to have the highest values of CFU/g which is more than 1100 MPN/g for the fecal coliform and 2 samples were positive for *Escherichia coli* which were sample 1 ("kerabu mangga") and sample 3 ("kerabu taugeh"). One sample was confirmed to be contaminated by *Salmonella* which was sample 4 ("kerabu mangga"). From the results, it can be concluded that RTE "kerabu" can serve as a vehicle for foodborne contamination, thus precautions should be taken to avoid food outbreak.