PEMBANGUNAN BEBOLA CENDAWAN TIRAM KELABU (*PLEUROTUS SAJOR CAJU*)

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LATIHAN ILMIAH INI DIKEMUKAKAN UNTUK MEMENUHI SEBAHAGIAN DARIPADA SYARAT MEMPEROLEHI IJAZAH SARJANA MUDA SAINS MAKANAN DENGAN KEPUJIAN (TEKNOLOGI MAKANAN DAN BIOPROSES)

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Karya ini adalah hasil kerja saya sendiri kecuali nukilan, ringkasan dan rujukan yang tiap-tiap satunya telah saya jelaskan sumbernya.

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ABSTRAK

PEMBANGUNAN BEBOLA CENDAWAN TIRAM KELABU (*PLEUROTUS SAJOR CAJU*)

Kajian ini dijalankan untuk membangunkan bebola cendawan *Pleurotus sajor caju* yang berkualiti dan bernutrisi. Sebanyak 9 formulasi dihasilkan melalui reka bentuk eksperimen. Serbuk *Pleurotus sajor caju* (15%, 20%, 25%) dan tepung *konjac* (3%, 5%, 7%) dijadikan sebagai faktor pembolehubah. Dari 9 formulasi, F1, F7 dan F8 dipilih dalam ujian sensori pemeringkatan lalu dibandingkan dalam ujian hedonik. Keputusan ujian hedonik menunjukkan F8 dengan 25% serbuk *Pleurotus sajor caju* dan 5% tepung *konjac* merupakan formulasi yang terbaik. Analisis proksimat yang dijalankan menunjukkan F8 mengandungi 1.98 ± 0.17% protein, 0.54 ± 0.12% lemak, 1.59 ± 0.15% abu, 76.25 ± 0.62% lembapan, 4.08 ± 0.35% serabut kasar dan 15.56 ± 0.17% karbohidrat. Nilai kalori F8 adalah 75.33 ± 1.53 kcal. Dari segi tekstur, ujian lipatan menunjukkan F8 memiliki kualiti gel yang tinggi iaitu Gred AA dan analisis tekstur profil menunjukkan kekerasan ialah 0.07 ± 0.01g, kekohesifan adalah 0.66 ± 0.02, kekenyalan ialah 0.70 ± 0.02 dan kekunyahan adalah 0.03 ± 0.01g. Kajian mutu simpanan dijalankan di bawah suhu 4°C selama 4 minggu dan perbezaan yang bersignifikasi ($p<0.05$) telah wujud dari segi warna dan kemampuan pegang air. Analisis mikrobiologi menunjukkan F8 masih berada dalam tahap yang selamat iaitu 4.3×10^3 cfu/g di dalam ujian kiraan plat dan 7.0×10^2 cfu/g di dalam ujian yis dan kulat selepas penyimpanan dijalankan selama 4 minggu. Dalam ujian pengguna, seramai 44% respondan akan membeli bebola cendawan (F8) ini sekiranya ia dipasarkan pada masa hadapan.

ABSTRACT

DEVELOPMENT OF GREY OYSTER MUSHROOM BALL (PLEUROTUS SAJOR CAJU)

This research was carried out to develop high quality and high nutritious Pleurotus sajor caju ball. Nine formulations were produced by experimental design. Pleurotus sajor caju powder (15%, 20%, 25%) and konjac flour (3%, 5%, 7%) were used as two main variables. Among 9 formulations, F1, F7 and F8 were chosen from ranking test and then compared in hedonic test. Results of hedonic test showed F8 with 25% Pleurotus sajor caju powder and 5% konjac flour was the best formulation. Proximate analysis showed F8 contains 1.98 ± 0.17% protein, 0.54 ± 0.12% fat, 1.59 ± 0.15% ash, 76.25 ± 0.62% moisture, 4.08 ± 0.35% crude fiber and 15.56 ± 0.17 carbohydrate. Caloric content of F8 is 75.33 ± 1.53 kcal. In terms of texture, folding test showed F8 had a Grade AA's high quality gel and texture profile analysis showed hardness, cohesiveness, springiness and chewiness of F8 are 0.07 ± 0.01g, 0.66 ± 0.02, 0.70 ± 0.02 and 0.03 ± 0.01g respectively. Shelf-life study was carried out on F8 under 4°C for 4 weeks and significant different ($p<0.05$) was observed in terms of colour and water holding capacity. Microbiological test showed F8 was maintained at the safety level after 4 weeks of storage according to result of total plate count and yeast and mould test which are 4.3×10^3 cfu/g and 7.0×10^2 cfu/g respectively. In consumer test, 44% of respondents will buy the mushroom ball (F8) if the mushroom ball is marketed in the future.

SENARAI KANDUNGAN

SENARAI JADUAL

SENARAI RAJAH

SENARAI PERSAMAAN

SENARAI SIMBOL

α	Alfa
β	Beta
λ	Jumlah berapa kali pasangan sampel yang sama dapat muncul di dalam semua blok
a*	Penunjuk kemerahan dan kehijauan objek
b	Jumlah bilangan blok yang digunakan
b*	Penunjuk kebiruan dan kekuningan objek
F	Formula
k	Jumlah bilangan sampel yang muncul di dalam setiap blok
L*	Penunjuk kecerahan dan kegelapan objek
n	Pembolehubah yang mewakili sesuatu kuantiti
o	Orto
p	Para
r	Jumlah berapa kali sampel yang sama dapat muncul di dalam semua blok
t	Jumlah bilangan sampel yang diuji
<	Kurang daripada
>	Lebih daripada

SENARAI SINGKATAN

AOAC	Association of Official Analytical Chemists
ANOVA	Analysis of variance
BIB	Blok tak lengkap terimbang (Balanced Incomplete Block)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
Fisher's LSD	Fisher's Least Significant Difference
MSG	Monosodium glutamat
NASS	National Agricultural Statistics Service
NPN	Nitrogen bukan protein (Non-protein nitrogen)
OH	Hidroksida
RDA	Recommended Dietary Allowance
sp.	Spesies
spp.	Spesies (kata jamak)
SPSS	Statistical Package for the Social Sciences
UNAPCAEM	United Nations Asian and Pacific Centre for Agricultural Engineering and Machinery
U.S.	United States of America
USDA	United States Department of Agriculture

SENARAI UNIT

°C	Darjah Celsius
°F	Darjah Fahrenheit
%	Peratus
µg	Mikrogram
cfu	Unit pembentuk koloni (colony forming unit)
cm	Sentimeter
cm^2	Sentimeter persegi
g	Gram
IU	International Unit (unit vitamin, 1IU vitamin = 40µg vitamin)
kcal	Kilokalori
kDa	Kilodalton
kg	Kilogram
mg	Miligram
ml	Mililiter
mm	milimeter
mm sec^{-1}	Milimeter per saat
pH	Ukuran keasidan dan kealkalian

SENARAI LAMPIRAN

BAB 1

PENDAHULUAN

1.1 Pengenalan

1.1.1 Bebola

Bebola boleh diklasifikasikan sebagai produk daging yang telah dihancurkan dengan baik ataupun dinamakan sebagai emulsi daging (Hsu dan Sun, 2006). Terdapat pelbagai jenis bebola di dalam pasaran Malaysia iaitu bebola lembu, bebola ayam dan bebola ikan. Bebola yang diperbuat daripada daging yang lain juga mendapat sambutan yang tinggi di negara Malaysia iaitu bebola khinzir, bebola udang dan bebola sotong (Huda *et al.*, 2007). Di bahagian Asia Tenggara, bebola biasanya dimakan bersama mi dalam diet seharian (Huda *et al.*, 2009).

Bebola ikan memiliki nama tempatan yang berlainan di bahagian Asia Tenggara iaitu *Bebola* (Malaysia dan Brunei), *Bakso* (Indonesia), *Jhi-ei* (Singapura), *Bola-bola* (Filipina) dan *Luk-chin pla* (Negara Thai) (Chng *et al.*, 1991; Huda *et al.*, 2000). Bebola daging pula memiliki nama tempatan yang berlainan di seluruh dunia iaitu *Kung-Wan* (Taiwan), *Koefte* (Turki), *Nem nuong* (Vietnam), *Polpette* (Itali), *Kofta* (India) dan *Konigsberger klopse* (Jerman) (Huda *et al.*, 2010b; Purnomo dan Rahardiyan, 2008; Hsu dan Chung, 2001; Serdaroglu dan Degirmencioglu, 2004; Porrini *et al.*, 1995). Pemprosesan bebola telah didapati berkembang dari perusahaan keluarga ke perusahaan kilang di bahagian Asia Tenggara. Keadaan ini berlaku adalah untuk meningkatkan pengeluaran bebola supaya permintaan bebola di pasaran tempatan dan antarabangsa dapat dipenuhi pada setiap masa (Huda *et al.*, 2000).

Di Asia Tenggara, bebola ikan mempunyai pasaran yang lebih luas berbanding dengan bebola ayam dan bebola daging (Noitup dan Raksakulthai, 1997). Di Malaysia,

bebola ikan yang berwarna putih lebih digemari oleh konsumer kerana warna putih menunjukkan kesegaran bebola (Huda *et al.*, 2008). Kebanyakan bebola ikan yang dihasilkan di Malaysia adalah diperbuat daripada ikan parang (*Chirocentrus sp.*), ikan beloso (*Saurida tumbil*), ikan kerisi (*Nemipterus japonicus*) dan ikan mata belo (*Priacanthus tayenus*) (Huda *et al.*, 2000).

1.1.2 Cendawan

Menurut *United Nations Asian and Pacific Centre for Agricultural Engineering and Machinery* (UNAPCAEM) (2010), cendawan merupakan makrokulat yang dapat dimakan oleh manusia. Menurut Chang dan Buswell (1996), cendawan dikenali sebagai "makanan Tuhan" pada zaman purba Yunani kerana manusia purba Yunani percaya bahawa cendawan dapat memberikan kekuatan kepada pahlawan mereka di dalam peperangan. Terdapat pelbagai jenis produk makanan telah berjaya dihasilkan dengan menggunakan cendawan pada hari ini iaitu serbuk sup cendawan, biskut cendawan, nuget cendawan, sos cendawan, gula cendawan dan kerepek cendawan (Rai dan Arumuganathan, 2008).

Berdasarkan kajian Peter (1991), Furlani dan Godoy (2007) dan Gupta *et al.* (2004), cendawan merupakan kulat yang sangat berharga kerana ia merupakan makanan yang berkualiti tinggi, sedap dan bernutrisi. Cendawan mempunyai kandungan protein yang tinggi termasuk pelbagai jenis asid amino yang penting dan amat diperlukan oleh badan manusia (Singh *et al.*, 1995; Bajaj *et al.*, 1996; Dunkwal *et al.*, 2007). Cendawan juga mempunyai kandungan lemak yang rendah iaitu sekurang-kurangnya 4%, kandungan vitamin yang tinggi termasuk vitamin B_1, vitamin B_2, vitamin C, niasin dan biotin, kandungan mineral yang tinggi termasuk fosforus, natrium, kalium dan kalsium, kandungan serabut dan kandungan karbohidrat yang tinggi (Peter, 1991; Asghar *et al.*, 2007). Dengan sebab ini, pemilihan dan penggunaan cendawan sebagai diet yang sihat telah menjadi semakin penting dan popular pada zaman sekarang (Dunkwal *et al.*, 2007).

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