UTILIZATION OF MANGO SEED KERNEL FOR THE DEVELOPMENT OF ANTIMICROBIAL FILMS

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INTRODUCTION

- Microbial contamination causes food spoilage and increase the risk of foodborne diseases

36 athletes, coaches fall ill due to food poisoning in Davao

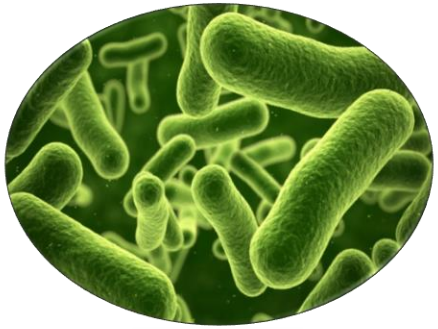
By: Allan Nawal - Correspondent / @inqmindanao Inquirer Mindanao / 11:23 AM February 18, 2018

'Food poisoning' downs 115 in South Cotabato

Health authorities determining if spoiled seafood caused the suspected food poisoning

Published November 19, 2016, 5:48 PM

Escherichia coli



STEC

***E.coli* O157:H7**

⬇

Hemolytic Uremic Syndrome

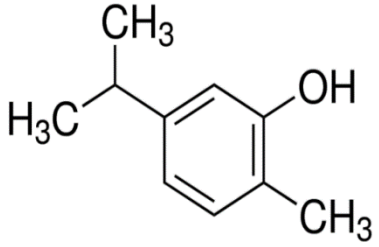
ANTIMICROBIAL FILM

• an active packaging that inhibits the growth of microorganisms

ANTIMICROBIAL AGENT + **POLYMER MATRIX** = **MICROBIAL GROWTH**

CARVACROL

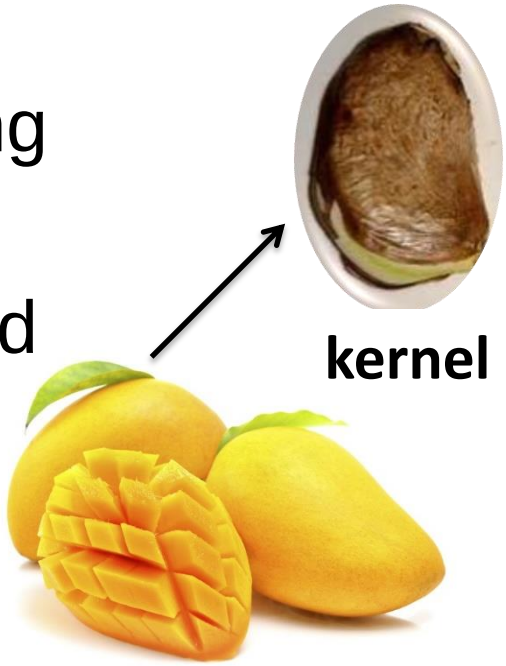
• an essential oil found in Oregano
• effective in controlling the growth of microorganisms
• GRAS



Mango

•40-60% waste from mango processing

- ❑ 15-20% accounts for the kernel
- ❑ kernel = 6.39% starch (Bahal and Bhardwaj, 2017)

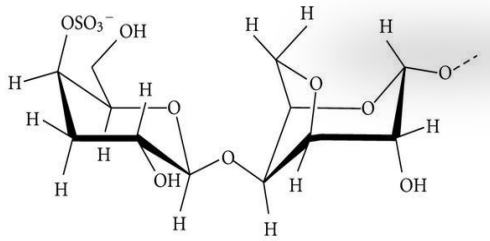


Carrageenan

• Polysaccharide extracted from the edible red seaweed

•Stabilizer, thickener, emulsifier

•GRAS



OBJECTIVES

GENERAL

To develop an antimicrobial mango starch (MS)-carrageenan (CG) film containing carvacrol

SPECIFIC

1. determine the yield of starch from mango seed kernel;
2. determine the purity of the extracted starch;
3. assess the effect of different concentrations of carvacrol in the films against *Escherichia coli* by disk diffusion assay; and
4. evaluate the antimicrobial efficacy of the films on commercial processed cheese.

STARCH EXTRACTION

Kernels

↓

Grinding

↓

Blending (+ 0.16% $NaHSO_3$)

↓

Centrifugation

↓

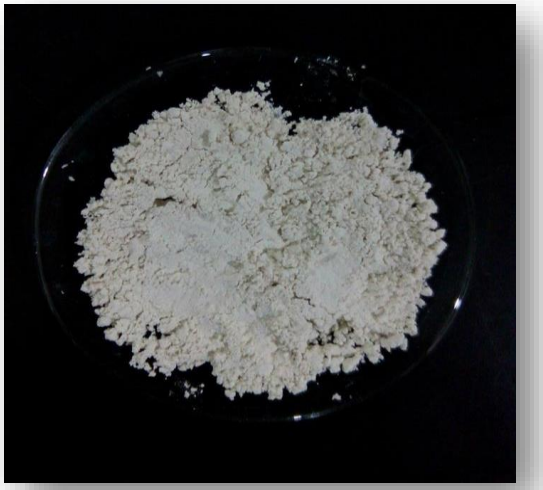
Drying

↓

Sifting

↓

Analysis



Starch Yield (w.b.)	3.83 %
Purity	70.88 %

PREPARATION OF MS-CG/ CARVACROL FILMS

Starch : carrageenan

↓ heating, cooling

Glycerol

↓

Carvacrol emulsion (4, 8, 12, 16 & 20%)

↓

Casting in plates

↓

Drying (50 °C)

↓

MS-CG/ carvacrol film

MS film without carrageenan

(~0.261 mm thick)

MS film with carrageenan

(~0.42 mm thick)

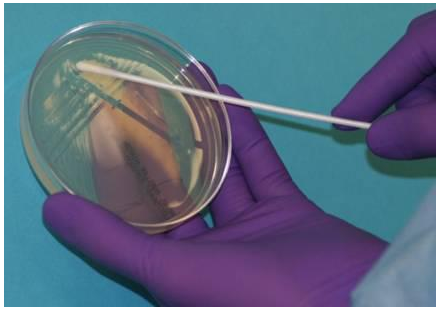
Addition of carrageenan

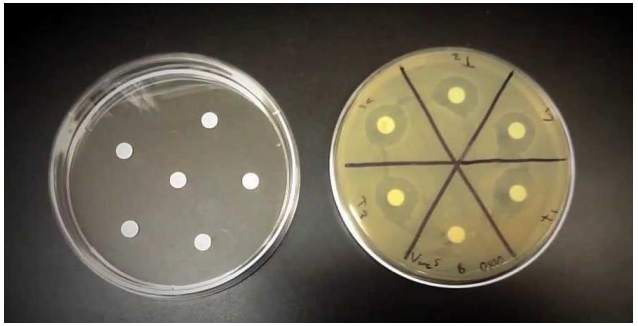
↓

Improved mechanical properties of the film

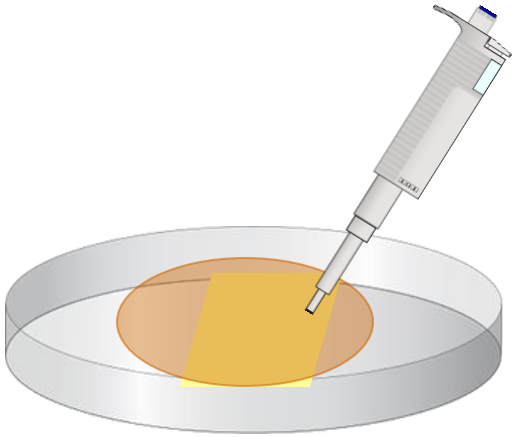
ANTIMICROBIAL TEST

Disk Diffusion Assay

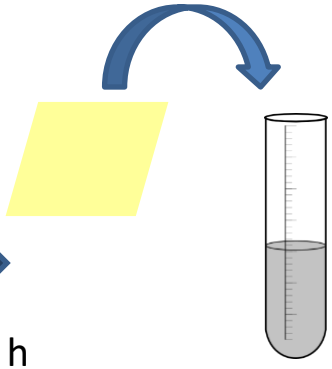




Actual Product Testing



4 °C, 24 h



VRBA

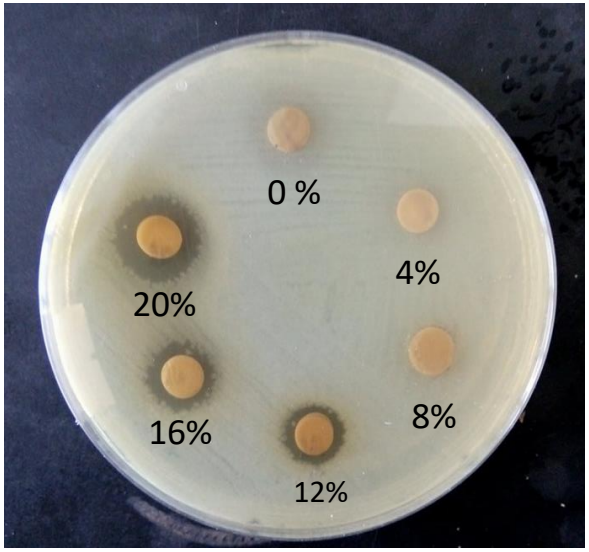
Inoculation with *E.coli*

ANTIMICROBIAL SUSCEPTIBILITY TEST

Effect of carvacrol concentration

Concentrations (% v/w)	Zone of inhibition diameter (mm)
0	0^{a}
4	0^{a}
8	0^{a}
12	10.76 ± 0.64^{b}
16	11.43 ± 0.61^{c}
20	13.91 ± 0.52^{d}

Treatments means within the column followed by the same letter are not significantly different at α=0.05.



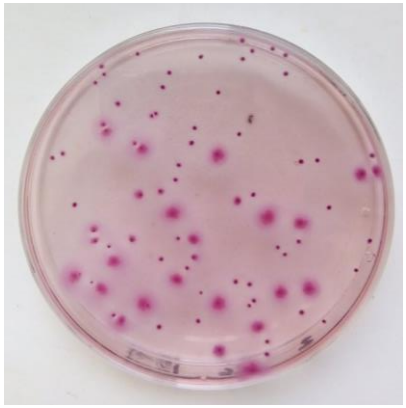
↑ Carvacrol concentration = ↑ Zone of inhibition

ACTUAL TESTING ON CHEESE

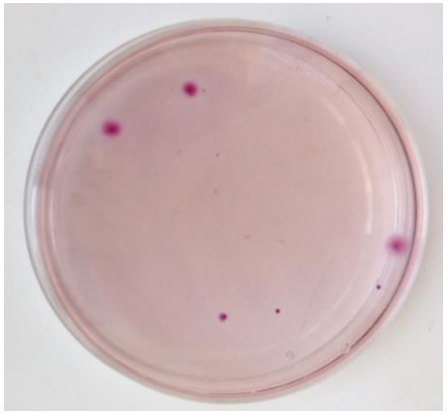
E.coli counts on cheese covered with MS-CG/carvacrol films stored at 4 °C for 24 h.

Carvacrol concentrations (% v/w)	*E.coli* count, Log CFU·mL^{-1}		
	Initial count	After 24 h	Log reduction[1]
0	5.93 ±0.162^{X}	5.54 ± 0.11^{aY}	**0.62**
12	5.93 ±0.162^{X}	4.93 ± 0.18^{bY}	

Within a column, a-b compares the significant difference between means α=0.05.
Within a row, X-Y compares the significant difference between means at α=0.05.
[1]Log reduction between 0% and 12% carvacrol.



CONTROL



12% carvacrol

CONCLUSION

- Mango starch-carrageenan (MS-CG)/carvacrol films showed antimicrobial activity against *E.coli*.
- Films containing 12% carvacrol had significantly reduced the microbial count of cheese by **0.62 log cycle or 76%** after 24 h of storage.

RECOMMENDATION

- test on other foodborne pathogens
- mechanical test
- migration test
- sensory evaluation of food product


Thank you!