ANTIBACTERIAL AND ANTIOXIDANT ACTIVITIES, PHYTOCHEMICAL AND TOXICITY ANALYSES OF ETHANOLIC *JAMBU BOL* [*Syzygium malaccense* (L.) Merr. and Perry] LEAVES EXTRACT AND ITS APPLICATION ON FOOD

By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

December 2021

FSTM 2022 10

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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December 2021

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Illnesses caused by food consumption are considered serious issues and must be solved. Synthetic food preservatives and sanitizers were used to overcome this issue, but many reports proved that these chemicals have side effects and could threaten human health. In contrast, plant-based preservatives and sanitizers are more recommended because plants are generally recognized as safe (GRAS), such as using *Syzygium malaccense* (L.) Merr. and Perry, one of the known plants used in folk medication. Thus, this research aimed to determine the antibacterial and stability of the ethanolic leaves extract of *S. malaccense* L. against *Bacillus* sp., *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Salmonella* Typhimurium, *Staphylococcus aureus*, and *Vibrio parahaemolyticus,* to determine the extract's total phenolic content (TPC) and antioxidants activity, to analyze toxicity and mode of action, to analyze its phytochemical constituents, and to evaluate the effect of the extract on microbial population in food samples. The results showed that the extract had an antibacterial activity with inhibition zone ranging 7.83 – 16.00 mm, MIC values ranging 0.31 – 5.00 mg/mL, MBC values went 0.62 – 5.00 mg/mL, and the analysis of the time-kill curves showed that the extract could reduce the bacterial population ≥ $3Log_{10}$ at a concentration of 4×MIC within 4.0 hours. Generally, the antibacterial activity of the extract was stable/no significant change after being treated at different pHs and temperatures. The total phenolic content of the extract was determined to be 44.10 ± 0.06 mg GAE/g and the antioxidants reducing power was 1013.50 ± 0.07 mM Fe^{2+} /g. The IC_{50} scavenging activity of DPPH and ABTS• were 0.0334 mg Ascorbic acid E/g and 0.1352 mg TE/g, respectively. Bacterial cell's constituent release recorded remarkable increases in the OD values of the absorbed cell's constituents (0.788) at 260nm at 4×MIC, which is the highest recorded value after the positive control chlorohexidine (0.813). Similarly, crystal violet assay results found that increasing the extract concentration increased the crystal violate uptake up to 91%. The GC-MS

analyses of the extract detected seven active compounds, and they possibly are pyrogallol, D-allose, palmitic acid, squalene, anacardic acid, α-tocopherol, and β-sitosterol. In comparison, LC-MS analysis detected eight active compounds, possibly be asiatic acid, astragalin, anacardic acid, ursolic acid, quercetin, myricetin, and catechin. These detected phytochemicals had reported having antimicrobial and antioxidant activities. The toxicity of the ethanolic extract was determined using hatched brine-shrimp larvae with LC_{50} of 7.402 mg/mL. In food application, the extract could kill and inhibit bacterial growth. The optimum antibacterial activity of the extract was recorded when food samples were treated for 30 minutes at concentrations 0.25%, 0.50%, and 1.00%, and storage temperature at 4°C and -18°C. In conclusion, ethanolic *S. malaccense* L. leaves extract had antibacterial and antioxidant activities, was stable under different pHs and temperatures, non-toxic at active concentration, and might be developed as a natural food preservative or food sanitizer before cooking.

Keywords: Antibacterial activity, antioxidant activity, natural food preservatives, *Syzygium malaccense* (L.) Merr. and Perry, toxicity.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

AKTIVITI ANTIBAKTERIA DAN ANTIOKSIDAN, ANALISIS FITOKIMIA DAN KETOKSIKAN EKSTRAK ETANOL DAUN JAMBU BOL [*Syzygium malaccense* (L.) Merr. dan Perry] DAN PENGGUNAANNYA PADA MAKANAN

Oleh

AL-ZABT ABDALRAHMAN MOHAMMAD KHAMEES

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Penyakit yang disebabkan oleh pengambilan makanan dikira sebagai isu serius dan perlu diselesaikan. Pengawet makanan sintetik dan pensanitasi telah digunakan untuk menyelesaikan isu ini, tetapi terdapat banyak laporan yang telah membuktikan bahan kimia ini mempunyai kesan sampingan dan boleh mengancam kesihatan manusia. Sebaliknya, bahan pengawet dan pensanitasi berasaskan tumbuhan adalah lebih digalakkan kerana tumbuhan secara umumnya dikenalpasti adalah selamat (GRAS), seperti menggunakan *Syzygium malaccense* (L.) Merr. and Perry, salah satu tanaman dikenali dalam perubatan tradisional. Oleh itu, kajian ini bertujuan untuk menentukan ciri antibakteria dan kestabilan ekstrak etanol daun *S. malaccense* L. terhadap *Bacillus* spp., *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Salmonella* Typhimurium, *Staphylococcus aureus*, dan *Vibrio parahaemolyticus*, untuk menentukan jumlah kandungan fenolik (TPC) ekstrak dan sifat antioksidan, untuk menganalisis ketoksikan dan cara tindakan, untuk menganalisis juzuk fitokimianya, dan untuk menilai kesan ekstrak ke atas populasi mikrob dalam sampel makanan. Keputusan menunjukkan bahawa ekstrak mempunyai aktiviti antibakteria dengan zon perencatan antara 7.83 – 16.00 mm, nilai MIC sekitar 0.31 – 5.00 mg/mL, nilai MBC sekitar 0.62 – 5.00 mg/mL, dan keluk masa-membunuh telah menunjukkan ekstrak tersebut dapat mengurangkan populasi bakteria ≥ $3Log_{10}$ pada kepekatan 4×MIC dalam masa 4.0 jam. Secara amnya, aktiviti antikbakteria ekstrak adalah stabil/tiada perubahan yang ketara selepas dirawat pada pH dan suhu yang berbeza. Jumlah kandungan fenolik ekstrak telah dikenalpasti pada 44.10 ± 0.06 mg GAE/g dan kuasa pengurangan antioksida adalah pada 1013.50 ± 0.07 mM Fe^{2+} /g. Nilai IC_{50} aktiviti pemerangkapan radikal DPPH dan ABTS• masing-masing pada 0.0334 mg Asid Askorbik E/g dan 0.1352 mg TE/g. Pembebasan konstituen sel bakteria merekodkan peningkatan yang luar biasa dalam nilai OD bagi konstituen sel yang diserap (0.788) pada 260nm dengan 4×MIC yang merupakan nilai tertinggi

yang direkodkan selepas kawalan positif kloroheksidin (0.813). Begitu juga, keputusan ujian kristal violat mendapati bahawa peningkatkan kepekatan ekstrak telah meningkatan penyerapan kristal violat sehingga 91%. Analisis GC-MS terhadap ekstrak telah mengenalpasti tujuh bahan aktif, dan bahan tersebut berkumungkinan adalah pyrogallol, D-allose, asid palmitik, squalene, asid anakardik, α-tokoferol dan β-sitosterol. Sebaliknya, analisis LC-MS telah mengesan lapan sebatian aktif, mungkin asid asiatik, astragalin, asid anakardik, asid ursolik, kuersetin, miricetin, dan katekin. Fitokimia yang dikenalpasti ini dilaporkan mempunyai aktiviti antimikrob dan antioksidan. Ketoksikan ekstrak etanol telah dkenalpasti menunggunakan larva air garam-udang yang menetas dengan LC_{50} sebanyak 7.402 mg/mL. Dalam aplikasi makanan, ekstrak ini dapat membunuh dan menghalang pertumbuhan bakteria. Optimum aktiviti antibakteria ekstrak direkodkan apabila sampel makanan dirawat selama 30 minit pada kepekatan 0.25%, 0.50%, dan 1.00% dan suhu pemyimpanan pada 4°C dan -18°C. Kesimpulannya, ekstrak etanol daun *S. malaccense* L. mempunyai aktiviti antibakteria dan antioksidan, stabil pada pHs dan suhu yang berbeza, tidak toksik pada kepekatan yang aktif, dan boleh dibangunkan sebagai pengawet makanan semula jadi atau pensanitasi makanan sebelum dimasak.

Kata Kunci: aktiviti antibakteria, aktiviti antioksidan, ketoksikan, pengawet makanan semula jadi, *Syzygium malaccense* (L.) Merr. dan Perry.

ACKNOWLEDGEMENTS

Alhamdulillah, thanks to Allah for the strength He has given to me, for the wisdom He granted me, and for the unconditional love, He showed me until I can complete my Doctor of Philosophy. Without You, I would never have had the perseverance to make it until the end.

I owe a deep sense of gratitude to my respective supervisor Assoc. Prof. Dr. Yaya Rukayadi for his keen interest in me at every stage of my Ph.D. research without forgetting his support and guidance during my master's degree. His prompt inspiration, timely suggestions, kindness, enthusiasm, and dynamism have enabled me to complete my thesis. I am incredibly thankful to the supervisor committee, Dr. Mohd Sabri Bin Pak Dek and Dr. Nurul Shazini Binti Ramli, for their inspiring advice and support. Also, I thank all the staff of the food science faculty, food three labs, for their kind and co-operation throughout my study period profusely.

Words could not describe my most profound appreciation to my beloved parents (Mohammad Khamees Al-Zabt and Eman Tariq Abu-Elsheikh) and my brothers (Abdullah, Abdulraheem, and Yaseen) for their love, encouragement, and understandings. I want to let them know that I may not achieve this project honestly without their prays and support. Thanks to my friend Mohammed Abu Alqomsan, who always supports me along my study journey. Lastly, thank you very much again to all of you that have been involved in my research. I will remember you all for the rest of my life.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
ATCC	American Type Culture Collection
CDC	Centers for Disease Control and Prevention
CFU	Colony forming unit
CHX	Chlorhexidine
CLSI	Clinical and Laboratory Standards Institute
DMSO	Dimethyl sulfoxide
GC-MS	Gas Chromatography – Mass Spectrometry
GRAS	Generally Recognized as Safe
LC	Lethality concentration
LC-MS	Liquid Chromatography – Mass Spectrometry
m/z	Mass/charge ratio
MBC	Minimum Bactericidal Concentration
MHB	Mueller Hinton broth
MIC	Minimum Inhibitory Concentration
MOH	Ministry of Health
OD	Optical density
PBS	Phosphate buffered saline
PCA	Plate Count Agar
PDB	Potato Dextrose Broth
ppm	Parts per million
rpm	Revolutions per minute
sp.	Species

sp.	Species among specific group
TPC	Total Plate Count
UPM	Universiti Putra Malaysia
WHO	World Health organization

CHAPTER 1

INTRODUCTION

1.1 Background

Raw food materials contamination, water supply contamination, poor handling practices, hygienic issues, improper treatment or storage, and incorrect declarations or expiration dates are significant factors leading to food spoilage and illness. Other factors that have increased the cases of foodborne diseases are food trading and food distribution worldwide, allowing cross-contamination among various food materials or ingredients, leading to changes in the microbial quality of contaminated food (Hussain and Dawson, 2013). However, food illness is a food disease that consumers consume contaminated food with foodborne pathogens. The most common symptoms associated with food disease that may appear within half to six hours of consuming contaminated food are vomiting, nausea, gut disturbance, and diarrhea. Food disease may lead to death (Hoffmann and Scallan, 2017). According to Faour-Klingbeil and Todd (2020), around six hundred people (almost 1 to 10 people in the world) become ill. They have food illness symptoms because of consuming contaminated food with foodborne pathogens. The most common pathogenic bacteria that cause food illnesses worldwide are *Bacillus cereus*, *Campylobacter jejuni*, *Clostridium botulinum*, *C. perfringens*, *Escherichia coli*, *Listeria monocytogenes*, *Salmonella* sp., *Shigella* sp., *Staphylococcus aureus*, *Vibrio* sp. and *Yersinia enterocolitica* (Bintsis, 2017).

Food poisoning outbreaks mainly occur in places where food is prepared and distributed to a group of people, such as wedding ceremonies, hotels, restaurants that provide all-you-can-eat buffet services, schools, prisons, and older adults' homes (Tewari and Abdullah, 2015). In 2016, Maharashtra, one of the Indian states, reported an outbreak at Men's Working Hostel related to food poisoning from improperly prepared meals that left 170 people ill (Grewal and Khera, 2017). The outbreak report of the hospital suggested that cooked chicken meals were the main reason for the outbreak. At the same time, the patent related to this case was believed to be *C. perfringens* or *B. cereus* based on the symptoms observed on illness people, which were diarrhea, abdominal cramps, and nausea. Another outbreak was reported in Maharashtra religious event that left 4000 people sick from consuming mung bean dal in 2015 (Bajaj and Dudeja, 2019). Food poisoning symptoms on poisoned people were diarrhea, abdominal cramps, fever with chills, and vomiting. At the same time, the expected pathogen that caused this outbreak was *E. coli* or *Salmonella* sp. based on the symptoms. In 2020, 84 patients with acute gastroenteritis were reported to be victims of an epidemic in a company cafeteria in Chungcheongnam-do Province, Korea (Lee et al*.,* 2020). The investigations found that *E. coli* contaminated food and *C. perfringens.* The source of contamination was three employees who handled rice where the employees found to be positive of *E. coli* and *C. perfringens*. In Malaysia, the incidence rate of reported food poisoning in 2013 was 47.79 per

100,000 populations, with a mortality rate of 0.04% (MOH, 2014). Moreover, in the year 2016, a total of 21 food poisoning cases involving schoolchildren were reported in Terengganu, Malaysia (Abdullah and Ismail, 2021). According to the reports, poultry was the most common food vehicle, and *Salmonella* sp. was the most common microbial etiological agent. Food poisoning incidents affect people's health and affect the country's reputation, leading to costs, especially those related to the tourism sector.

Food additives have uncountable benefits such as maintaining the quality of food, preventing the texture from loss or separating, and preservatives for extending the shelf life of food to keep it available for consumption any time in the year. As part of food additives, food preservatives have advantages, but they also have some disadvantages related to consumer health. For example, benzoate as an antimicrobial agent is a chemical preservative used in small amounts. Still, it has been reported that consuming benzoate causes skin allergen and brain damage (Abdulmumeen et al*.,* 2014). Chemical preservatives are generally recognized as safe (GRAS) in small and controlled amounts. However, they are still a source of concern where consumers are looking for a safer alternative that may be derived from green sources. Hence, industries tend to use plant-based preservatives and sanitizers to preserve food and increase its shelf-life and quality maintenance (Bondi et al*.,* 2017).

Plants are a valuable source of bioactive compounds with antibacterial and antioxidant activities. Plant bioactive compounds have different chemical properties. Many plants possess bioactive compounds that have antibacterial effects on foodborne pathogens and scavenging free radicals. Herbs have been used in food since ancient times for flavoring and saving fare for a long time without being spoiled. Plant extracts, essential oils, and peptides have a wide range of bioactivities. The antibacterial and antioxidant properties of plants are mainly attributed to secondary metabolites such as polyphenols, phenylpropanoid, flavonoids, terpenes, and anthocyanins (Dhiman and Aggarwal, 2019). One of the plant genera known as the medical plant is *Syzygium*. *Syzygium* is a kind of flora belonging to the Myrtaceae myrtle family. The genus contains around 1200 species and is endemic to the Pacific from Africa to South Asia. Its maximum diversity is in Malaysia and northeast Australia (Ahmad et al*.,* 2016; Bouman et al*.,* 2021). Essential oils of *S. aromaticum* are known for their antibacterial activity against several pathogenic bacteria such as *S. aureus*, *E. coli*, *L. monocytogenes,* and *S*. Typhimurium (Radünz et al*.,* 2019). Furthermore, *S. cumini* leaves crude extract and essential oil have been reported to have antioxidant activity and antibacterial activity against foodborne pathogens, including *Bacillus subtilis*, *E. coli*, *Enterococcus faecalis*, *Neisseria gonorrhoeae*, *Pseudomonas aeruginosa*, and *S. aureus* (Mohamed et al*.,* 2013). Moreover, *S. aquarium* and *S. samarangense* Leaves extracts have been found to exhibit antioxidant activity, in addition, to be effective as an antimicrobial agent against most foodborne pathogens, including *E. coli, Klebsiella pneumoniae*, *L. monocytogenes, P. aeruginosa S. aureus,* and *Salmonella* Typhi and against food spoilage pathogens including *Candida* sp, *Cochliobolus* sp, *Penicillium* sp., and *Fusarium* sp. (Khandaker et al*.,* 2015; Habisukan et al*.,* 2021; Raj et al*.,* 2021). Hence, the *Syzygium* genus contains various plants whose extracts

possess antibacterial and antioxidant activities and may be used in food as preservatives or washing sanitizers.

Syzygium malaccense (L.) Merr. and Perry, also known as the Malay apple, is a flowering tree believed to be a native of Malaysia. It is commonly cultivated from Indonesia to the Philippines and Vietnam in Bengal and South India (Morton, 1987). Different studies have been done on Malay apple species. The results suggest that these species are rich in phytochemicals such as alkaloids, flavonoids, quinones, phenols, steroids, triterpenoids, saponins, and tannins (Fauziah et al*.,* 2019). In folk medicine, Malay apple bark powder was used to treat throat thrush caused by *C. albicans* growth through the mouth and throat. Seed, fruit, bark, stem, and leaves extracts to exhibit variable antibiotic activity levels against *Micrococcus pyrogens* Var. *aureus*. The fruit extract shows antibacterial activity against *E. coli,* while the bark and leaves excerpts are efficient against *Shigella*. The root extract treats itching and a diuretic and edema reduction. The powdered leaves effectively cure tongue cracks, and the crushed leaves are used as skin lotion (Pullaiah, 2006). Furthermore, leaves were reported to have cytotoxic (Itam and Anna, 2020), antibiotic (Morton 1987), antimicrobial (Savi et al*.,* 2020), antioxidant, and antihyperglycemic activities (Arumugam et al*.,* 2014). Due to the variety of bioactivities of this plant, this study has been focused on the possibility of using *S. malaccense* L. leaves extract in the food matrix as a food preservative or food washing sanitizer.

1.2 Problem Statements

Food can be easily contaminated at any stage, from farm to fork, during harvesting, storing, handling, pre-processing, or even after processing. The causes of the contamination are many, but cross-contamination among food staff and contaminants from food handlers are the most common causes (Bencardino et al*.,* 2021; Kirchner et al*.,* 2021). Without proper decontamination techniques, pathogenic bacteria that live naturally on food or are transferred to the food from contaminant sources will keep growing and multiplying and produce toxins that razing the possibility of the occurrence of foutbreaksreak (Coskun et al*.,* 2021). To overcome this issue, types of food sanitizer and food preservatives were used to prevent bacterial growth on food or to reduce their numbers, such as chlorine, organic acids, hydrogen peroxide, sorbic acid, sodium sorbate, benzoic acid, sodium benzoate, nitrites, nitrates, and sulfur dioxide (Martins et al*.,* 2021). Using these chemicals has solved the issue of preventing bacterial growth in a food or increased the shelf-life of food. Still, on the other hand, many health issues have been reported and associated with using chemical preservatives or food sanitizers in food, such as food allergies, food intolerance, cancer, multiple sclerosis, attention deficit, hyperactivity, brain damage, nausea, and cardiac diseases (Gupta and Yadav, 2021). Thus, applying plant-based extracts or essential oils was the suggested effective alternative of using chemicals as food sanitizers or preservatives. Antimicrobials, antioxidants, and color or texture enhancers (Pateiro et al*.,* 2021). Hence, this study was undertaken to discover the antibacterial activity of ethanolic *S. malaccense* L. leaves extract as a food

washing sanitizer and food preservative against natural bacteria found in raw food and evaluate its toxicity.

S. malaccense L. has been reported to have a diversity of phytochemicals that possess different bioactivities. Thus, there were reports on the antimicrobial activity of extracts extracted from other plant parts and various solvents. According to Varghese (2015), the methanolic leaves extract of *S. malaccense* L. had antimicrobial activity against *Proteus* and *Candida albicans*. Furthermore, the ethanolic leaves extract of *S. malaccense* L. was effective as an antibacterial substance against *B. subtilis, E. coli, P. aeruginosa,* and *S. aureus* (Yuniarni et a., 2020). Moreover, the leaves and seeds extracts of *S. malaccense* L. have antibacterial activity against *B. subtilis*, *E. coli*, and *S. aureus,* as reported by Madhushika and Udukala (2021). However, more investigations on the antibacterial activity of *S. malaccense* L. leaves extract need to be studied epically related to foodborne pathogens because a wide range of pathogens can be found even on the same type of food and cause food poisoning. Hence, this research has extensively studied the ethanolic leaves extract of *S. malaccense* L. and focused on its antibacterial activity, mode of action, and antioxidant activity.

1.3 Objectives

1. To determine the antibacterial activity of ethanolic *S. malaccense* L. leaves extract against selected foodborne pathogens.

2. To determine the total phenolic content (TPC) and the antioxidant activity of ethanolic *S. malaccense* L. leaves extract using DPPH and ABTS• radicals scavenging activity assays and ferric reducing power (FRAP).

3. To determine the toxicity of ethanolic *S. malaccense* L. leaves extract on brine-shrimp (*Artemia salina*) in lethality assay and to determine the antibacterial mode of action of the extract through cell's constituent release and crystal violet assays.

4. To analyse the phytochemical compounds in ethanolic *S. malaccense* L. leaves extract

5. To evaluate the effect of ethanolic *S. malaccense* L. leaves extract on the microbial population on raw food samples.

REFERENCES

Abadias, M., Canamas, T. P., Asensio, A., Anguera, M. and Vinas, I. (2006). Microbial quality of commercial '*Golden Delicious'* apples throughout production and shelf-life of Lleida (Catalonia, Spain). *International Journal of Food Microbiology*, 108(3): 404-409.

Abatcha, M. G. (2020). Prevalence and antimicrobial resistance of *Staphylococcus aureus* isolated from vegetables sold in Malaysian wet markets. *Malaysian Journal of Microbiology*, 16(1): 34-39.

Abd El-Salama, E. A., Morsy, N. F. S., and Hammad, K. S. M. (2020). Optimisation of ultrasound assisted extraction of pomposia (*Syzygium cumini* L.) anthocyanins and phenolic compounds based on response surface methodology. *International Food Research Journal*, 27(6); 1046-1056.

Abd Rahim, E. N. A., Ismail, A., Omar, M. N., Rahmat, U. N., and Ahmad, W. A. N. W. (2018). GC-MS analysis of phytochemical compounds in *Syzygium polyanthum* leaves extracted using ultrasound-assisted method. *Pharmacognosy Journal*, 10(1): 110-119.

Abdullah, N. B. A., and Ismail, A. F. (2021). Food poisoning outbreaks among schoolchildren in Terengganu and their associated factors, *Sains Malaysiana*. 50(4): 1027-1036.

Abdullah, S. A., and Jamil, S. (2019). Phytochemical screening and antioxidant activities of Methanol extracts from eight Syzygium species. *Malaysian Journal of Fundamental and Applied Sciences*, 16(1): 13-17.

Abdulmumeen, H. A., Risikat, A. N., and Sururah, A. R. (2012). Food: Its preservatives, additives and applications. *International Journal of Chemical and Biochemical Sciences*, 1(2012): 36-47.

Abdul-Mutalib, A. N., Osman, M., and Nordin, S. A. (2019). Prevalence of spoilage microorganism, *Pseudomonas* sp. on restaurants cutting boards collected in Seri Kembangan, Malaysia. *Journal of Food Science and Nutrition*, 2(2): 7-12.

Abutbul, S., Golan-Goldhirsh, A., Barazani, O., Ofir, R., and Zilberg, D. (2005). Screening of desert plants for use against bacterial pathogens in fish. *The Palestinian Journal of Aquaculture – Bamidgeh*, 57(2): 71-80.

Ačkar, Đ., Babić, J., Jozinović, A., Miličević, B., Jokić, S., Miličević, R., ... and Šubarić, D. (2015). Starch modification by organic acids and their derivatives: A review. *Molecules,* 20(10): 19554-19570.

Addgene. (2014). Creating bacterial glycerol stocks for long-term storage of plasmids.

Aguilera-Otíz, M., Reza-Vargas, M., Chew-Madinaveita, R. G., and Meza-Velázquez, J. A. (2011). Propiedades funcionales de las antocianinas. *Biotecnia,* 13(2): 16-22.

Ahmad, B., Baider, C., Bernardini, B., Biffin, E., Brambach, F., Burslem, D., ... and Wilson, P. G. (2016). *Syzygium* (Myrtaceae): Monographing a taxonomic giant via 22 coordinated regional revisions. *Journal of Life and Environmental Sciences*, 4: e1930v1.

Ahmed, A., Labu, Z. K., Dey, S. K., Hira, A., Howlader, M. S. I., Mohamed Hemayet Hossain, M.H., Roy, J. (2015). Phytochemical screening, antibacterial and cytotoxic activity of different fractions of *Xylocarpus mekongensis* Bark. *Ibnosina Journal of Medicine and Biomedical Sciences*, 5: 206-213.

Aijuka, M., and Buys, E. M. (2019). Persistence of foodborne diarrheagenic *Escherichia coli* in the agricultural and food production environment: Implications for food safety and public health. *Food Microbiology*, 82(2019): 363-370.

Aiyegoro, O. A., Afolayan, A. J., and Okoh, A. I. (2009). *In vitro* antibacterial time kill studies of leaves extracts of *Helichrysum longifolium*. *Journal of Medicinal Plants Research*, 3(6): 462-467.

Akram, F. E., El-Tayeb, T., Abou-Aisha, K., and El-Azizi, M. (2016). A combination of silver nanoparticles and visible blue light enhances the antibacterial efficacy of ineffective antibiotics against methicillin-resistant *Staphylococcus aureus* (MRSA). *Annals of Clinical Microbiology and Antimicrobials*, 15(1): 1-13.

Alaboudi, A. R., Ababneh, M., Osaili, T. M., and Shloul, K. A. (2016). Detection, identification, and prevalence of pathogenic *Vibrio parahaemolyticus* in fish and coastal environment in Jordan. *Journal of Food Science*, 81(1): 130-134.

Al-Azzawie, H. F., and Alhamdani, M. S. S. (2006). Hypoglycemic and antioxidant effect of oleuropein in alloxan-diabetic rabbits. *Life Sciences*, 78(12): 1371-1377.

Al-Dughaym, A. M. and Altabari. A. F. (2010). Safety and quality of some chicken meat products in Al-Ahsa markets-Saudi Arabia. *Saudi Journal of Biological Sciences*, 17(1): 37-42.

Alegbeleye, O. O., Opeolu, B. O., and Jackson, V. (2017). Bioremediation of polycyclic aromatic hydrocarbon (PAH) compounds:(acenaphthene and fluorene) in water using indigenous bacterial species isolated from the Diep and Plankenburg rivers, Western Cape, South Africa. *Brazilian Journal of Microbiology*, 48(2): 314-325.

Al-Habib, A., Al-Saleh, E., Safer, A. M., and Afzal, M. (2010). Bactericidal effect of grape seed extract on methicillin-resistant *Staphylococcus aureus* (MRSA). *The Journal of Toxicological Sciences*, 35(3): 357-364.

Alli, J. A., Boboye, B. E., Okonko, I. O., Kolade, A. F., and Nwanze, J. C. (2011). *In-vitro* assessments of the effects of garlic (*Allium sativum*) extract on clinical isolates of *Pseudomonas aeruginosa* and *Staphylococcus aureus*. *Applied Scientific Research*, 2(4): 25-36.

Al-Salih, D. A. A. K., Aziz, F. M., Mshimesh, B. A. R., and Jehad, M. T. (2013). Antibacterial effects of vitamin E: *in vitro* study. *Journal of Biotechnology Research Center,* 7(2): 17-23.

Altemimi, A., Lakhssassi, N., Baharlouei, A., Watson, D. G., and Lightfoot, D. A. (2017). Phytochemicals: Extraction, isolation, and identification of bioactive compounds from plant extracts. *Plants*, 6(4): 42-65.

Alwan, A. H., and Talak, M. A. (2015). Isolation and characterization of *Staphylococcus aureus* in spoiled food samples. *International Journal of Current Microbiology and Applied Sciences*, 4(3): 645-651.

Alwash, M. S., Ibrahim, N. and Ahmad, W. Y. (2013). Identification and mode of action of antibacterial components from *Melastoma malabathricum* Linn. leaves. *American Journal of Infectious Diseases,* 9(2): 46-58.

Alzoreky, N. S., and Nakahara, K. (2003). Antibacterial activity of extracts from some edible plants commonly consumed in Asia. *The International Journal of Food Microbiology*, 80(2): 223–230.

Amboupe, D. S., Hartana, A., and Purwanto, Y. (2019). Ethnobotanical study of food plant in Bentong community from Barru Regency, south Sulawesi-Indonesia. *Media Konservasi*, 24(3): 278-286.

Amin, H. M., and Tawfick, M. M. (2021). High risk of potential diarrheagenic *Bacillus cereus* in diverse food products in Egypt. *Journal of Food Protection*, 84(6): 1033-1039.

Amli, S. U. R., An, L., and Ukayadi, Y. (2018). Antibacterial and sporicidal activities of *Syzygium polyanthum* L. extract against *Bacillus cereus* isolated from rice (Aktiviti antibakteria dan sporisid ekstrak *Syzygium polyanthum* L. terhadap *Bacillus cereus* yang dipencil daripada nasi). *Sains Malaysiana*, 47(10): 2301-2310.

Anantachoke, N., Lomarat, P., Praserttirachai, W., Khammanit, R., and Mangmool, S. (2016). Thai fruits exhibit antioxidant activity and induction of antioxidant enzymes in HEK-293 cells. *Evidence-Based Complementary and Alternative Medicine*, 2016(1): 1-14.

Antolak, H., and Kregiel, D. (2017). *Food preservatives from plants*. InTech, Berlin, Germany.

Anulika, N. P., Ignatius, E. O., Raymond, E. S., Osasere, O. I., and Abiola, A. H. (2016). The chemistry of natural product: Plant secondary metabolites. *International Journal of Technology Enhancements and Emerging Engineering Research,* 4(8): 1-9.

Apu, A. S., Muhit, M. A., Tareq, S. M., Pathan, A. H., Jamaluddin, A. T. M., and Ahmed, M. (2010). Antimicrobial activity and brine-shrimp lethality bioassay of the leaves extract of *Dillenia indica* Linn. *Journal of Young Pharmacists*, 2(1): 50-53.

Araújo, M. G., Hilário, F., Vilegas, W., Dos Santos, L. C., Brunetti, I. L., Sotomayor, C. E., & Bauab, T. M. (2012). Correlation among antioxidant, antimicrobial, hemolytic, and antiproliferative properties of Leiothrix spiralis leaves extract. *International Journal of Molecular Sciences*, 13(7): 9260-9277.

Argudín, M. Á., Mendoza, M. C., and Rodicio, M. R. (2010). Food poisoning and *Staphylococcus aureus* enterotoxins. *Toxins*, 2(7): 1751-1773.

Arumugam, B., Palanisamy, U. D., Chua, K. H., and Kuppusamy, U. R. (2019). Protective effect of myricetin derivatives from *Syzygium malaccense* against hydrogen peroxide-induced stress in ARPE-19 cells. *Molecular Vision*, 2019(25): 47-59.

Aryal, S., Baniya, M. K., Danekhu, K., Kunwar, P., Gurung, R., and Koirala, N. (2019). Total phenolic content, flavonoid content and antioxidant potential of wild vegetables from Western Nepal. *Plants*, 8(4): 96.

Asnaashari, M., Bagher Hashemi, S. M., Mehr, H. M., and Asadi Yousefabad, S. H. (2015). Kolkhoung (*Pistacia khinjuk*) hull oil and kernel oil as antioxidative vegetable oils with high oxidative stability and nutritional value. *Food Technology and Biotechnology*, 53(1): 81-86.

Augusta, I. M., Nascimento, K. O., Couto, M. A. P. G., and Borges, S. V. (2013, August). Antioxidant activity of pulp rose apple (*Syzygium malaccensis*) in unripe and ripe state. *VII Congreso Ibérico de Agroingeniería y Ciencias Hortícolas,* 2013(1): 26-29.

Aung, E. E., Kristanti, A. N., Aminah, N. S., Takaya, Y., and Ramadhan, R. (2020). Plant description, phytochemical constituents and bioactivities of *Syzygium* genus: A review. *Open Chemistry*, 18(1): 1256-1281.

Azwanida, N. N. (2015). A review on the extraction methods use in medicinal plants, principle, strength and limitation. *Medicinal and Aromatic Plants*, 4(196): 2167-0412.

Azziz-Baumgartner, E., Lindblade, K., Gieseker, K., Rogers, H. S., Kieszak, S., Njapau, H., …, and Aflatoxin Investigative Group. (2005). Case-control study of an acute aflatoxicosis outbreak, Kenya, 2004. *Environmental Health Perspectives*, 113(12): 1779–1783.

Bacteriological Analytical Manual (BAM). (1998). U. S. Food and Drug Administration. 8th Edition, Revision A.

Bae, J., Kim, N., Shin, Y., Kim, S. Y., and Kim, Y. J. (2020). Activity of catechins and their applications. *Biomedical Dermatology*, 4(1): 1-10.

Bairy, K. L., Sharma, A., and Shalini, A. (2005). Evaluation of the hypoglycemic, hypolipidaemic and hepatic glycogen raising effects of *Syzygium malaccense* upon streptozotocin induced diabetic rats. *Journal of Natural remedies*, 5(1): 46-51.

Bairy, K. L., Sharma, A., and Shalini, A. (2005). Evaluation of the hypoglycemic, hypolipidaemic and hepatic glycogen raising effects of *Syzygium malaccense* upon streptozotocin induced diabetic rats. *Journal of Natural Remedies*, 5(1): 46-51.

Bajaj, S., and Dudeja, P. (2019). Food poisoning outbreak in a religious mass gathering. *Medical Journal Armed Forces India*, 75(3): 339-343.

Bakir, D. S., Yalcin, G., and Cucu, A. K. (2020). Isolation and determination of tocopherols and tocotrienols from the seed of *Capparis ovata* grown in Turkey by reversed-phase high-performance liquid chromatography. *Chromatographia*, 83(1): 77-86.

Bantawa, K., Rai, K., Subba Limbu, D., and Khanal, H. (2018). Food-borne bacterial pathogens in marketed raw meat of Dharan, eastern Nepal. *BMC Research Notes*, 11(1): 1-5.

Baptista, R. C., Horita, C. N., and Sant'Ana, A. S. (2020). Natural products with preservative properties for enhancing the microbiological safety and extending the shelf-life of seafood: A review. *Food Research International*, 127(1): 108762-108765.

Barbosa-Ferreira, M., Dagli, M. L. Z., Maiorka, P. C., and Górniak, S. L. (2005). Sub-acute intoxication by *Senna occidentalis* seeds in rats. *Food and Chemical Toxicology*, 43(4): 497-503.

Bari, M. L., and Yeasmin, S. (2018). Foodborne diseases and responsible agents. In Grumezescu, A. M., and Holban, A. M. (Eds.), *Food Safety and Preservation* (pp. 195-229). Academic Press.

Basak, S., Singh, P., and Rajurkar, M. (2016). Multidrug resistant and extensively drug resistant bacteria: a study. *Journal of Pathogens*, 2016(1): 4653-4662.

Batista, Â. G., da Silva, J. K., Cazarin, C. B. B., Biasoto, A. C. T., Sawaya, A. C. H. F., Prado, M. A., and Júnior, M. R. M. (2017). Red-jambo (*Syzygium malaccense*): Bioactive compounds in fruits and leaves. *LWT-Food Science and Technology*, 76(1): 284-291.

Baysal, O., and Yildiz, A. (2017). *Bacillus subtilis*: An industrially important microbe for enzyme production. *Econicron Microbiology*, 5(1): 148-156.

Bencardino, D., Amagliani, G., and Brandi, G. (2021). Carriage of *Staphylococcus aureus* among food handlers: An ongoing challenge in public health. *Food Control*, 130(1): 1-12.

Bensid, A., El Abed, N., Houicher, A., Regenstein, J. M., and Özogul, F. (2020). Antioxidant and antimicrobial preservatives: Properties, mechanism of action and applications in food–a review. *Critical Reviews in Food Science and Nutrition*, 2020(1): 1-17.

Benzie, I. F., and Strain, J. J. (1996). The ferric reducing ability of plasma (FRAP) as a measure of "antioxidant power": the FRAP assay. *Analytical Biochemistry*, 239(1): 70-76.

Bernatoniene, J., and Kopustinskiene, D. M. (2018). The role of catechins in cellular responses to oxidative stress. *Molecules*, 23(4): 965-976.

Bhandare, S. G., Sherikar, A. T., Paturkar, A. M., Waskar, V. S., and Zende, R. J. (2007). A comparison of microbial contamination on sheep/goat carcasses in a modern Indian abattoir and traditional meat shops. *Food Control*, 18(7): 854-858.

Bhaskar, S. V. (2017). Foodborne diseases—disease burden. In Käferstein, F., and Abdussalam, M. (Ed.) *Food Safety in the 21st Century* (pp. 1-10). Academic Press.

Bintsis T. (2017). Foodborne pathogens. *AIMS Microbiology*, 3(3): 529–563.

Biswas, D. and Roymon, M. G. (2013). LC/ TOF/ ESI/ MS based detection of bioactive compounds present in leaf and bark extract of *Acacia arabica*. *Recent Research in Science and Technology,* 5(2): 37-40.

Biswas, D., and Micallef, S. A. (2016). Diversity of foodborne bacterial pathogens and parasites in produce and animal products and limitations of current detection practices. *Food Borne Pathogens and Antibiotic Resistance* (pp. 5-19). Wiley Online Library.

Blekas, G. A. (2016). *Food additives: classification, uses and regulation*. Elsevier

Bondi, M., Lauková, A., Niederhausern, S., Messi, P., and Papadopoulou, C. (2017). Natural preservatives to improve food quality and safety. *Journal of Food Quality*, 2017(4): 1-8.

Borlinghaus, J., Albrecht, F., Gruhlke, M. C., Nwachukwu, I. D., and Slusarenko, A. J. (2014). Allicin: chemistry and biological properties. *Molecules*, 19(8): 12591-12618.

Bouman, R. W., Kessler, P. J., Telford, I. R., Bruhl, J. J., Strijk, J. S., Saunders, R. M., and van Welzen, P. C. (2021). Molecular phylogenetics of Phyllanthus sensulato (Phyllanthaceae): Towards coherent monophyletic taxa. *International Association for Plant Taxonomy*, 70(1): 72-98.

Brackett, R.E. (1992). Shelf stability and safety of fresh produce as influenced by sanitation and disinfection. *Journal of Food Protection*, 55(10): 808-814.

Breijyeh, Z., Jubeh, B., and Karaman, R. (2020). Resistance of Gram-negative bacteria to current antibacterial agents and approaches to resolve it. *Molecules*, 25(6): 1340-1364.

Broberg, C. A., Calder, T. J., and Orth, K. (2011). *Vibrio parahaemolyticus* cell biology and pathogenicity determinants. *Microbes and Infection*, 13(12-13): 992–1001.

Budiono, B., Elfita, E., Muharni, M., Yohandini, H., and Widjajanti, H. (2019). Antioxidant activity of *Syzygium samarangense* L. and their endophytic fungi. *Molekul*, 14(1): 48-55.

Burt, S. (2004). Essential oils: their antibacterial properties and potential applications in foods—a review. *International Journal of Food Microbiology*, 94(3): 223-253.

Burt, S. A., van der Zee, R., Koets, A. P., de Graaff, A. M., van Knapen, F., Gaastra, W., ... and Veldhuizen, E. J. (2007). Carvacrol induces heat shock protein 60 and inhibits synthesis of flagellin in *Escherichia coli* O157: H7. *Applied and Environmental Microbiology*, 73(14): 4484-4490.

Caamaño-Antelo, S., Fernández-No, I. C., Böhme, K., Ezzat-Alnakip, M., Quintela-Baluja, M., Barros-Velázquez, J., and Calo-Mata, P. (2015). Genetic discrimination of foodborne pathogenic and spoilage *Bacillus* sp. based on three housekeeping genes. *Food Microbiology*, 46(1): 288-298.

Calbo, E., Freixas, N., Xercavins, M., Riera, M., Nicolás, C., Monistrol, O., ... and Garau, J. (2011). Foodborne nosocomial outbreak of SHV1 and CTX-M-15–producing *Klebsiella pneumoniae*: epidemiology and control. *Clinical Infectious Diseases*, 52(6): 743-749.

Camire, M. E., Camire, A., and Krumhar, K. (1990). Chemical and nutritional changes in foods during extrusion. *Critical Reviews in Food Science and Nutrition*, 29(1): 35-57.

Campêlo, M. C. S., Medeiros, J. M. S., and Silva, J. B. A. (2019). Natural products in food preservation. *International Food Research Journal*, 26(1): 41-46.

Carrasco, E., Morales-Rueda, A., and García-Gimeno, R. M. (2012). Cross-contamination and recontamination by *Salmonella* in foods: a review. *Food Research International*, 45(2): 545-556.

Castro, S. B. R., Leal, C. A., Freire, F. R., Carvalho, D. A., Oliveira, D. F., and Figueiredo, H. C. P. (2008). Antibacterial activity of plant extracts from Brazil against fish pathogenic bacteria. *The Brazilian Journal of Microbiology*, 39(4): 756–760.

CDC, what is a foodborne disease outbreak and why do they occur. (2012).

Chang, J.M. and Fang, T.J. (2007). Survival of *Escherichia coli* O157:H7 and *Salmonella enterica* serovars Typhimurium in iceberg lettuce and the antimicrobial effect of rice vinegar against *E. coli* O157:H7. *Food Microbiology,* 24(7-8): 745-751.

Chen, X. J., Meng, Z. Y.Wang, P., Lu, C. L., Yang, Y. Z., Zhang, L., … and Chen, S. (2015). Evaluation of household cleaning methods for reducing chlorantraniliprole residues on cowpea fruits. *Journal of Agricultural Science*, 7(9): 129-137.

Chua, L. K., Lim, C. L., Ling, A. P. K., Chye, S. M., and Koh, R. Y. (2019). Anticancer potential of Syzygium species: a review. *Plant Foods for Human Nutrition*, 74(1): 18-27.

Chumber, S. K., Kaushik, K., and Savy, S. (2007). Bacteriological analysis of street foods in Pune. *Indian Journal of Public Health*, 51(2): 6-114.

Clinical and Laboratory Standards Institute (CLSI). (2012). Reference method for dilution antimicrobial susceptibility tests for bacteria that grow aerobically; approved standard-ninth edition; CLSI document M07-A9. Clinical and Laboratory Standards Institute, Wayne, PA, USA.

Clinical and Laboratory Standrads Institute (CLSI). (2008). Reference method for broth dilution antifungal susceptibility testing of yeasts; approved standard-third edition; CLSI document M27 - A3. Clinical and Laboratory Standards Institute, Wayne, PA, USA.

Coskun, E., Ozturk, S., Akpinar, M., Halkman, A. K., and Erdogdu, F. (2021). Effect of far infrared heating process on surface decontamination and quality attributes of whole yellow and white onions. *Food Control*, 130(1): 1-11.

Costa, D., Bousseau, A., Thevenot, S., Dufour, X., Laland, C., Burucoa, C., and Castel, O. (2015). Nosocomial outbreak of *Pseudomonas aeruginosa* associated with a drinking water fountain. *The Journal of Hospital Infection*, 91(3): 271–274.

Cowan, M. M. (1999). Plant products as antimicrobial agents. *Clinical Microbiology Reviews*, 12(4): 564-582.

Crowe, S. J., Bottichio, L., Shade, L. N., Whitney, B. M., Corral, N., Melius, B., ... and Neil, K. P. (2017). Shiga toxin–producing *E. coli* infections associated with flour. *New England Journal of Medicine*, 377(21): 2036-2043.

Crozier, A., Clifford, M. N., and Ashihara, H. (Eds.). (2008). *Plant secondary metabolites: occurrence, structure and role in the human diet*. John Wiley and Sons.

Curran, B., Morgan, J. A. W., Honeybourne, D., and Dowson, C. G. (2005). Commercial mushrooms and bean sprouts are a source *of Pseudomonas aeruginosa*. *Journal of Clinical Microbiology*, 43(11): 5830-5831.

Cynthia, I. F., Hery, S., and Akhmad, D. (2018). Antibacterial and antioxidant activities of pyrogallol and synthetic pyrogallol dimer. *Research Journal of Chemistry and Environment,* 22(2): 39-47.

Da Silveira, S. M., Luciano, F. B., Fronza, N., Cunha Jr, A., Scheuermann, G. N., and Vieira, C. R. W. (2014). Chemical composition and antibacterial activity of *Laurus nobilis* essential oil towards foodborne pathogens and its application in fresh Tuscan sausage stored at 7ºC. *LWT-Food Science and Technology*, 59(1): 86-93.

Davidson, P. M. (1997). Chemical preservatives and natural antimicrobial compounds. In M. P. Doyle, L. R. Beuchat, and T. J. Montville (Eds.): *Food Microbiology: Fundamentals and Frontiers* (pp. 520-556). Washington, DC: American Society for Microbiology.

Davidson, P. M., and Naidu, A. S. (2000). Phyto-phenols. In A. S. Naidu (Ed.): *Natural Food Antimicrobial Systems* (pp. 265-294). Boca Raton, FL: CRC Press.

Davidson, P. M., Taylor, T. M., and Schmidt, S. E. (2012). Chemical preservatives and natural antimicrobial compounds. *Food Microbiology: Fundamentals and Frontiers*, 3(278): 765-801.

Del Olmo, A., Calzada, J., and Nuñez, M. (2017). Benzoic acid and its derivatives as naturally occurring compounds in foods and as additives: Uses, exposure, and controversy. *Critical Reviews in Food Science and Nutrition*, 57(14): 3084-3103.

Dhiman, R., and Aggarwal, N. K. (2019). Efficacy of plant antimicrobials as preservative in food. In Sonia, A., Anca, C., and Thierry, A (Ed.): *Food Preservation and Waste Exploitation* (pp. 48-67). IntechOpen.

Dierick, K., Van Coillie, E., Swiecicka, I., Meyfroidt, G., Devlieger, H., Meulemans, A., ... and Mahillon, J. (2005). Fatal family outbreak of *Bacillus cereus*-associated food poisoning. *Journal of Clinical Microbiology*, 43(8): 4277-4279.

Diggle, S. P., and Whiteley, M. (2020). Microbe profile: *Pseudomonas aeruginosa*: opportunistic pathogen and lab rat. *Microbiology*, 166(1): 30-33.

Doan, C. H., and Davidson, P. M. (2000). Microbiology of potatoes and potato products: a review. *Journal of Food Protection*, 63(5): 668-683.

Domínguez, R., Pateiro, M., Gagaoua, M., Barba, F. J., Zhang, W., and Lorenzo, J. M. (2019). A comprehensive review on lipid oxidation in meat and meat products. *Antioxidants*, 8(10): 429-460.

Dontha, S. (2016). A review on antioxidant methods. *Asian Journal of Pharmaceutical and Clinical Research*, 9(2): 14-32.

Durairaj, S., Srinivasan, S. and Lakshmanaperumalsamy, P. (2009). *In vitro* antibacterial activity and stability of garlic extract at different pH and temperature. *Electronic Journal of Biology*, 5(1): 5-10.

Dwivedi, S., Prajapati, P., Vyas, N., Malviya, S., and Kharia, A. (2017). A review on food preservation: Methods, harmful effects and better alternatives. *Asian Journal of Pharmacy and Pharmacology*, 2017(3): 193-199.

EFSA Panel on Biological Hazards (BIOHAZ). (2016). Growth of spoilage bacteria during storage and transport of meat. *EFSA Journal*, 14(6): e04523.

El-Arabi, T. F., and Griffiths, M. W. (2021). *Bacillus cereus*. In Cliver, D. O., and Riemann (Ed.): *Foodborne infections and intoxications* (pp. 431-437). Academic Press.

El-Farmawi., E. Olama, D.Z. and Holail, H. (2014). The antibacterial effect of some natural bioactive materials against *Klebsiella pneumoniae* and MRSA. *International Journal of Current Microbiology and Applied Science*, 3(1): 576-588.

Erb, M., and Kliebenstein, D. J. (2020). Plant secondary metabolites as defences, regulators, and primary metabolites: the blurred functional trichotomy. *Plant Physiology*, 184(1): 39-52.

Erkmen, O., and Bozoglu, T. F. (2016). *Food Microbiology, 2 Volume Set: Principles into Practice*. John Wiley and Sons.

Errington, J., and van der Aart, L. T. (2020). Microbe Profile: *Bacillus subtilis*: model organism for cellular development, and industrial workhorse. *Microbiology*, 166(5): 425-427.

Escuderos, M. E., Sayago, A., Morales, M. T., and Aparicio, R. (2009). Evaluation of α-tocopherol in virgin olive oil by a luminescent method. *International Journal of Fats and Oils*, 60(4): 336-342.

Eshwarappa, R. S. B., Iyer, R. S., Subbaramaiah, S. R., Richard, S. A., and Dhananjaya, B. L. (2014). Antioxidant activity of Syzygium cumini leaf gall extracts. *BioImpacts*, 4(2): 101-107.

Faille, C., Benezech, T., Midelet-Bourdin, G., Lequette, Y., Clarisse, M., Ronse, G., ... and Slomianny, C. (2014). Sporulation of *Bacillus* sp. within biofilms: a potential source of contamination in food processing environments. *Food Microbiology*, 40(3): 64-74.

Faour-Klingbeil, D., and Todd, E. C. D. (2020). Prevention and control of foodborne diseases in middle-east north African countries: review of national control systems. *International Journal of Environmental Research and Public Health*, 17(1): 70-93.

Fauziah, N., Noviyanti, N., and Musthapa, I. (2019). Pemanfaatan kayu batang *Jambu Bol* (*Syzygium malaccense* (L). Merr. and Perry) sebagai sumber antioksidan baru. *Jurnal Ilmiah Farmako Bahari*, 10(1): 33-41.

Fennema, O. R., Damodaran, S., and Parkin, K. L. (2017). Introduction to food chemistry. In Damodaran, S., Parkin, K. L., and Fennema, O. R. (Eds.), *Fennema's food chemistry* (pp. 1-16). CRC Press.

Fernandes, F. A., and Rodrigues, S. (2018). *Jambo—Syzygium malaccense*. In Rodrigues, S., Silva, E., and Brito, E. (Ed.), *Exotic Fruits* (pp. 245-249). Academic Press.

Fernández-No, I. C., Guarddon, M., Böhme, K., Cepeda, A., Calo-Mata, P., and Barros-Velázquez, J. (2011). Detection and quantification of spoilage and pathogenic *Bacillus cereus*, *Bacillus subtilis* and *Bacillus licheniformis* by real-time PCR. *Food Microbiology*, 28(3): 605-610.

Fetsch, A., Contzen, M., Hartelt, K., Kleiser, A., Maassen, S., Rau, J., ... and Strommenger, B. (2014). *Staphylococcus aureus* food-poisoning outbreak associated with the consumption of ice-cream. *International Journal of Food Microbiology*, 187(1): 1-6.

Foster, J.W. (1995). Low pH adaptation and the acid tolerance response of *Salmonella* Typhimurium. *Criticals Review in Microbiology,* 21(4): 215-37.

Foti, M. C., Daquino, C., and Geraci, C. (2004). Electron-transfer reaction of cinnamic acids and their methyl esters with the DPPH• radical in alcoholic solutions. *The Journal of Organic Chemistry*, 69(7): 2309-2314.

Frankel, E. N. (1989). The antioxidant and nutritional effects of tocopherols, ascorbic acid and beta-carotene in relation to processing of edible oils. *Bibliotheca Nutritio et Dieta*, 1989(43): 297-312.

Frauches, N. S., do Amaral, T. O., Largueza, C. B. D., and Teodoro, A. J. (2016). Brazilian Myrtaceae fruits: a review of anticancer proprieties. *Journal of Pharmaceutical Research International*, 12(1): 1-15.

French, G. L. (2006). Bactericidal agents in the treatment of MRSA infections—the potential role of daptomycin. *Journal of Antimicrobial Chemotherapy*, 58(6): 1107-1117.

From, C., Hormazabal, V., and Granum, P. E. (2007). Food poisoning associated with pumilacidin-producing *Bacillus pumilus* in rice. *International Journal of Food Microbiology*, 115(3): 319-324.

Gao, D., Kawai, N., and Tamiya, T. (2011). The anti-inflammatory effects of D-allose contribute to attenuation of cerebral ischemia–reperfusion injury. *Medical Hypotheses*, 76(6): 911-913.

Gaulin, C., Viger, Y. B., and Fillion, L. (2002). An outbreak of *Bacillus cereus* implicating a part-time banquet caterer. *Canadian Journal of Public Health*, 93(5): 353-355.

Geiges O. (1996). Microbial processes in frozen food. *Advances in Space Research*, 18(12): 109-118.

Geneva, S. (2004). WHO Guidelines on safety monitoring of herbal medicines in pharmacovigilance systems. World Health Organization.

Gerhäuser, C., Klimo, K., Heiss, E., Neumann, I., Gamal-Eldeen, A., Knauft, J., ... and Frank, N. (2003). Mechanism-based *in vitro* screening of potential cancer chemopreventive agents. *Mutation Research-Fundamental and Molecular Mechanisms of Mutagenesis*, (523-524): 163-172.

Ghaly, A. E., Dave, D., Budge, S., and Brooks, M. S. (2010). Fish spoilage mechanisms and preservation techniques. *American Journal of Applied Sciences*, 7(7): 859-877.

Ghimire, G. P., Nguyen, H. T., Koirala, N., and Sohng, J. K. (2016). Advances in biochemistry and microbial production of squalene and its derivatives. *Journal of Microbiology and Biotechnology*, 26(3): 441-451.

Gil, M.I., Selma, M.V., Lopez-Galvez, F. and Allende, A. (2009). Fresh-cut product sanitation and wash disinfection: problems and solutions. *International Journal of Food Microbiology,* 134(1-2): 37-45.

Gohil, N., Bhattacharjee, G., Khambhati, K., Braddick, D., and Singh, V. (2019). Engineering strategies in microorganisms for the enhanced production of squalene: advances, challenges and opportunities. *Frontiers in Bioengineering and Biotechnology*, 7(1): 50-127.

Gökmen, V., and Morales, F. (2014). *Encyclopedia of food safety*. Academic Press

Gomes, T. A., Elias, W. P., Scaletsky, I. C., Guth, B. E., Rodrigues, J. F., Piazza, R. M., ... and Martinez, M. B. (2016). Diarrheagenic *Escherichia coli*. *Brazilian Journal of Microbiology*, 47(1): 3-30.

Gonçalves-Tenório, A., Silva, B. N., Rodrigues, V., Cadavez, V., and Gonzales-Barron, U. (2018). Prevalence of pathogens in poultry meat: a meta-analysis of European published surveys. *Foods*, 7(5): 69-85.

Gonelimali, F. D., Lin, J., Miao, W., Xuan, J., Charles, F., Chen, M., and Hatab, S. R. (2018). Antimicrobial properties and mechanism of action of some plant extracts against food pathogens and spoilage microorganisms. *Frontiers in Microbiology*, 9(1): 16-39.

Górniak, I., Bartoszewski, R. and Króliczewski, J. (2019). Comprehensive review of antimicrobial activities of plant flavonoids. *Phytochemistry Reviews,* 18(1): 241–272.

Grewal, V. S., and Khera, A. (2017). Outbreak of food poisoning in a working men's hostel: A retrospective cohort study. *Medical Journal of Dr. DY Patil University*, 10(6): 517-521.

Guo, N., Gai, Q. Y., Jiao, J., Wang, W., Zu, Y. G., and Fu, Y. J. (2016). Antibacterial activity of *Fructus forsythia* essential oil and the application of EO-loaded nanoparticles to food-borne pathogens. *Foods*, 5(4): 73-86.

Guo, Y., Zhou, H., Qin, L., Pang, Z., Qin, T., Ren, H., ... and Zhou, J. (2016). Frequency, antimicrobial resistance and genetic diversity of *Klebsiella pneumoniae* in food samples. *PLOS One*, 11(4): e0153561.

Gupta, R., and Yadav, R. K. (2021). Impact of chemical food preservatives on human health. *PalArch's Journal of Archaeology of Egypt/Egyptology,* 18(15): 811-818.

Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R., and Meybeck, A. (2011). Global food losses and food waste. *Food and Agriculture Organization*. Rome: Italy.

Gyawali, R., and Ibrahim, S. A. (2012). Impact of plant derivatives on the growth of foodborne pathogens and the functionality of probiotics. *Applied Microbiology and Biotechnology*, 95(1): 29-45.

Habisukan, U. H., Widjajanti, H., Setiawan, A., and Kurniawati, A. R. (2021). Antioxidant and antimicrobial activity of *endophytic* fungi isolated from *Syzygium aqueum* leaves. In Eduard, A., and Shashkin (ED.): *Journal of Physics: Conference Series* (p. 012059). IOP Publishing.

Hafez, H. M. (2019). Foodborne diseases and poultry production. *Lohmann Information*, 53(2): 20-36.

Halder, S., Yadav, K. K., Sarkar, R., Mukherjee, S., Saha, P., Haldar, S., ... and Sen, T. (2015). Alteration of Zeta potential and membrane permeability in bacteria: a study with cationic agents. *Springer Plus*, 4(1): 1-14.

Hamad, Y. K., Abobakr, Y., Salem, M. Z., Ali, H. M., Al-Sarar, A. S., and Al-Zabib, A. A. (2019). Activity of plant extracts/essential oils against three plant pathogenic fungi and mosquito larvae: GC/MS analysis of bioactive compounds. *Bio Resources*, 14(2): 4489-4511.

Harborne, J. B., Saito, N., and Detoni, C. H. (1994). Anthocyanins of *Cephaelis*, *Cynomorium*, *Euterpe*, *Lavatera* and *Pinanga*. *Biochemical Systematics and Ecology*, 22(8): 835-836.

Harmon, S. M., Kautter, D. A., and Solomon, H. M. (1987). *Bacillus cereus* contamination of seeds and vegetable sprouts grown in a home sprouting kit. *Journal of Food Protection*, 50(1): 62-65.

Haryani, Y., Noorzaleha, A. S., Fatimah, A. B., Noorjahan, B. A., Patrick, G. B., Shamsinar, A. T., ... and Son, R. (2007). Incidence of *Klebsiella pneumonia* in street foods sold in Malaysia and their characterization by antibiotic resistance, plasmid profiling, and RAPD–PCR analysis. *Food Control,* 18(7): 847-853.

He, J., Tang, X. M., Liu, T. T., Peng, F., Zhou, Q., Liu, L. W., ... and Xue, W. (2021). Synthesis and antibacterial activity of novel myricetin derivatives containing sulfonyl piperazine. *Chemical Papers*, 75(3): 1021-1027.

Hefferon, K. (2012). *Let Thy Food Be Thy Medicine: Plants and Modern Medicine*. Oxford University Press.

Heini, N., Stephan, R., Ehling-Schulz, M., and Johler, S. (2018). Characterization of *Bacillus cereus* group isolates from powdered food products. *International Journal of Food Microbiology*, 283(1): 59-64.

Hellwig, M. (2019). The chemistry of protein oxidation in food. *Angewandte Chemie*, 58(47): 16742-16763.

Hidayati, M. D., Ersam, T., Shimizu, K., and Fatmawati, S. (2017). Antioxidant activity of *Syzygium polyanthum* extracts. *Indonesian Journal of Chemistry*, 17(1): 49-53.

Hoffmann, S., and Scallan, E. (2017). Epidemiology, cost, and risk analysis of foodborne disease. In Dodd, C., Aldsworth, T., and Stein, R. (Ed.): *Foodborne diseases* (pp. 31-63). Academic Press.

Hoffmann, S., Devleesschauwer, B., Aspinall, W., Cooke, R., Corrigan, T., Havelaar, A., ... and Hald, T. (2017). Attribution of global foodborne disease to specific foods: Findings from a World Health Organization structured expert elicitation. *PLOS One*, 12(9): e0183641.

Hollands, A., Corriden, R., Gysler, G., Dahesh, S., Olson, J., Ali, S. R., ... and Nizet, V. (2016). Natural product anacardic acid from cashew nut shells stimulates neutrophil extracellular trap production and bactericidal activity. *Journal of Biological Chemistry*, 291(27): 13964-13973.

Holley, R. A., and Patel, D. (2005). Improvement in shelf-life and safety of perishable foods by plant essential oils and smoke antimicrobials. *Food Microbiology*, 22(4): 273-292.

Hong, C.K., Seo, Y.H., Choi, C.M., Hwang, I.S. and Kim, M.S. (2012). Microbial quality of fresh vegetables and fruits in Seoul, Korea. *Journal of Food Hygiene and Safety*, 27(1): 24-29.

Hooper, D. C., and Jacoby, G. A. (2016). Topoisomerase inhibitors: fluoroquinolone mechanisms of action and resistance. *Cold Spring Harbor Perspectives in Medicine*, 6(9): a025320.

Hoornstra, D., Andersson, M. A., Teplova, V. V., Mikkola, R., Uotila, L. M., Andersson, L. C.,and Salkinoja-Salonen, M. S. (2013). Potato crop as a source of emetic *Bacillus cereus* and cereulide-induced mammalian cell toxicity. *Applied and Environmental Microbiology*, 79(12): 3534-3543.

Hossain, H., Rahman, S. E., Akbar, P. N., Khan, T. A., Rahman, M. M., and Jahan, I. A. (2016). HPLC profiling, antioxidant and *in vivo* anti-inflammatory activity of the ethanol extract of *Syzygium jambos* available in Bangladesh. *BMC Research Notes*, 9(1): 1-8.

Huang, C. B., Alimova, Y., Myers, T. M., and Ebersole, J. L. (2011). Short-and medium-chain fatty acids exhibit antimicrobial activity for oral microorganisms. *Archives of Oral Biology*, 56(7): 650-654.

Huang, Z. R., Lin, Y. K., and Fang, J. Y. (2009). Biological and pharmacological activities of squalene and related compounds: potential uses in cosmetic dermatology. *Molecules*, 14(1): 540-554.

Hussain, M. A., and Dawson, C. O. (2013). Economic impact of food safety outbreaks on food businesses. *Foods*, 2(4): 585-589.

Hutt, P. B., and Hutt, P. B. I. (1984). A history of government regulation of adulteration and misbranding of food. *Food Drug Cosmetic Law Journal*, 44(2): 99-117.

Huzmi, H., Ina-Salwany, M. Y., Natrah, F. M. I., Syukri, F., and Karim, M. (2019). Strategies of controlling vibriosis in fish. *Asian Journal of Applied Sciences*, 7(5): 513-521.

Hwang, C.A. (2016). Effect of mayonnaise pH and storage temperature on the behavior of *Listeria monocytogenes* in ham salad and potato salad. *Journal of Food Protection*, 68(8): 1628-1634.

Hwang, D., and Lim, Y. H. (2015). Resveratrol antibacterial activity against *Escherichia coli* is mediated by Z-ring formation inhibition via suppression of FtsZ expression. *Scientific Reports*, 5(1): 1-10.

Hyun, S. B., Bae, S., and Hyun, C. G. (2020). Antioxidant activities of *Jeju* Wax apple (*Syzygium Samarangense*) and safety of human keratinocytes and primary skin irritation test. *Cosmetics*, 7(2): 39-54.

Ibrahim, S., Wei Hoong, L., Lai Siong, Y., Mustapha, Z., CW Zalati, C. W., Aklilu, E., and Kamaruzzaman, N. F. (2021). Prevalence of antimicrobial resistance (amr) *Salmonella* sp. and *Escherichia coli* isolated from broilers in the east coast of Peninsular Malaysia. *Antibiotics*, 10(5): 579-590.

Ifeoma, O., and Oluwakanyinsola, S. (2013). Screening of herbal medicines for potential toxicities. *New Insights into Toxicity and Drug Testing*, 244(11): 63-88.

Inanç, T., and Maskan, M. (2012). The potential application of plant essential oils/extracts as natural preservatives in oils during processing: a review. *Journal of Food Science and Engineering*, 2(1): 1-9.

Ismail, I. S., Ismail, N., and Lajis, N. (2010). Ichthyotoxic properties and essential oils of *Syzygium malaccense* (Myrtaceae). *Pertanika Journal of Science and Technology*, 18(1): 1-6.

Itam, A., and Anna, L. (2020). Antioxidant activities, cytotoxic properties and total phenolic content of *Syzygium malaccense* (L.) Merr. and LM Perry leaves extracts: A West Sumatera Indonesian plant. *Pakistan Journal of Pharmaceutical Sciences*, 33(1): 175-181.

Iulietto, M. F., Sechi, P., Borgogni, E., and Cenci-Goga, B. T. (2015). Meat spoilage: a critical review of a neglected alteration due to ropy slime producing bacteria. *Italian Journal of Animal Science*, 14(3): 11-40.

Ivanov, M., Kannan, A., Stojkovic, D., Glamoclija, J., Grdadolnik, S. G., Sanglard, D., and Sokovic, M. (2020). Revealing the astragalin mode of anticandidal action. *Experimental and Clinical Sciences Journal*, 19(1): 14-36.

Jadhav, V., Kalase, V. and Pati, P. (2014). GC-MS analysis of bioactive compounds in methanolic extract of *Holigarna grahamii* (wight) Kurz. *International Journal of Herbal Medicine,* 2(4): 35-39.

Jami, M., Ghanbari, M., Zunabovic, M., Domig, K. J., abd Kneifel, W. (2014). *Listeria monocytogenes* in aquatic food products—a review. *Comprehensive Reviews in Food Science and Food Safety*, 13(5): 798-813.

Jamshidi-Kia, F., Lorigooini, Z., and Amini-Khoei, H. (2018). Medicinal plants: Past history and future perspective. *Journal of Herbmed Pharmacology*, 7(1): 1-7.

Jantsch, J., Chikkaballi, D., and Hensel, M. (2011). Cellular aspects of immunity to intracellular *Salmonella* enterica. *Immunological Reviews*, 240(1): 185-195.

Jay, M.J. (2000). *Food Analysis: Theory and Practices.* New Delhi: CBS Publishers and Distributors.

Jia, Q., Liu, X., Wu, X., Wang, R., Hu, X., Li, Y., and Huang, C. (2009). Hypoglycemic activity of a polyphenolic oligomer-rich extract of *Cinnamomum parthenoxylon* bark in normal and streptozotocin-induced diabetic rats. *Phytomedicine*, 16(8): 744-750.

Johler, S., Tichaczek-Dischinger, P. S., Rau, J., Sihto, H. M., Lehner, A., Adam, M., and Stephan, R. (2013). Outbreak of Staphylococcal food poisoning due to SEA-producing *Staphylococcus aureus*. *Foodborne Pathogens and Disease*, 10(9): 777-781.

John, T. Y. H. (2012). *Bacillus cereus* and *Bacillus thuringiensis* in ready-to-eat cooked rice in Malaysia. *International Food Research Journal*, 19(3): 829-836.

Jun, H., Kim, J., Bang, J., Kim, H., Beuchat, L.R. and Ryu, J.H. (2013). Combined effects of plant extracts in inhibiting the growth of *Bacillus cereus* in reconstituted infant rice cereal. *International Journal of Food Microbiology*, 160(3): 260-266.

Jung, J. Y., and Yang, J. K. (2014). Insecticidal activity of extracts isolated from *Syzygium aromaticum*. *Journal of The Korean Wood Science and Technology*, 42(5): 624-633.

Jung, Y., Jang, H. and Matthews, K.R. (2014). Effect of the food production chain from farm practices to vegetable processing on outbreak incidence. *Microbiology Biotechnology*, 7(6): 517-527.

Kajiya, K., Hojo, H., Suzuki, M., Nanjo, F., Kumazawa, S., and Nakayama, T. (2004). Relationship between antibacterial activity of (+)-catechin derivatives and their interaction with a model membrane. *Journal of Agricultural and Food Chemistry*, 52(6): 1514-1519.

Kanagasabapathy, G., Malek, S. N. A., Kuppusamy, U. R., and Vikineswary, S. (2011). Chemical composition and antioxidant properties of extracts of fresh fruiting bodies of *Pleurotus sajor-caju* (Fr.) Singer. *Journal of Agricultural and Food Chemistry*, 59(6): 2618-2626.

Kapoor, G., Saigal, S., and Elongavan, A. (2017). Action and resistance mechanisms of antibiotics: A guide for clinicians. *Journal of Anaesthesiology, Clinical Pharmacology*, 33(3): 300-307.

Karim, A. B., Latip, A. L., Abd Shukor, A. S., Rashid, N. A., Mohd, W. M. W., and Kamaludin, F. (2017). A large common source outbreak of *Salmonella* Typhimurium linked to Kuala Terengganu night markets, Malaysia, 2014. *Outbreak, Surveillance, Investigations and Response*, 10(2): 1-7.

Karola, B., Inmaculada, C., Jorge, B., Jose, M., Benito, C., and Pilar, C. (2012). Species identification of food spoilage and pathogenic bacteria. In Kapiris, K. (Ed.), *Nutrition and Food Science* (pp. 39-49). InTech.

Karsha, P. V. and Lakshmi, O. B. (2010). Antibacterial of black pepper (*Piper negrum* Linn.) with special references to its mode of action on bacteria. *Indian Journal of Natural Products and Resources*, 1(2): 213-215.

Khalaf, O. M., Abdel-Aziz, M. S., El-Hagrassi, A. M., Osman, A. F., and Ghareeb, M. A. (2021, May). Biochemical Aspect, Antimicrobial and Antioxidant Activities of Melaleuca and *Syzygium* Species (Myrtaceae) Grown in Egypt. *Journal of Physics: Conference Series,* 1879(2): 22062-22075.

Khandaker, M. M., Mat, N., and Boyce, A. N. (2015). Bioactive constituents, antioxidant and antimicrobial activities of three cultivars of wax apple (*Syzygium samarangense*) fruits. *Research Journal of Biotechnology,* 10(1): 7-16.

Kilonzo-Nthenge, A., and Mukuna, W. (2018). *Salmonella* and antimicrobial resistance in fresh produce. In Demirbilek, S. K. (Ed.), *Salmonella-A re-emerging pathogen* (pp. 75-83). Intech Open.

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(3): 89-94.

Kinderlerer, J. L., and Hatton, P. V. (1990). Fungal metabolites of sorbic acid. *Food Additives and Contaminants*, 7(5): 657-669.

King, N. J., Whyte, R., and Hudson, J. A. (2007). Presence and significance of *Bacillus cereus* in dehydrated potato products. *Journal of Food Protection*, 70(2): 514-520.

Kinsey, C. B., Koirala, S., Solomon, B., Rosenberg, J., Robinson, B. F., Neri, A., ... and Gould, C. V. (2017). *Pseudomonas aeruginosa* outbreak in a neonatal intensive care unit attributed to hospital tap water. *Infection Control and Hospital Epidemiology*, 38(7): 801-808.

Kirchner, M., Goulter, R. M., Chapman, B. J., Clayton, J., and Jaykus, L. A. (2021). Cross-contamination on atypical surfaces and venues in food service environments. *Journal of Food Protection*, 84(7): 1239-1251.

Kirk, M. D., Angulo, F. J., Havelaar, A. H., and Black, R. E. (2017). Diarrhoeal disease in children due to contaminated food. *Bulletin of the World Health Organization*, 95(3): 233–234.

Klaiber, R.G., Baur, S., Wolf, G., Hammes, W.P. and Carle, R. (2005). Quality of minimally processed carrots as affected by warm water washing and chlorination. *Innovative Food Science and Emerging Technologies,* 6(1): 351-362.

Kocacaliskan, I., Talan, I., Terzi, I. (2006). Antimicrobial activity of catechol and pyrogallol as allelochemicals. *Journal of Bioscience*, 61(9-10): 639-642.

Komlaga, G., Cojean, S., Beniddir, M. A., and Loiseau, P. M. (2015). *The antimalarial potential of three Ghanaian medicinal plants*. KNUST Space: Institutional Repositories for KNUST.

Komlaga, G., Cojean, S., Dickson, R. A., Beniddir, M. A., Suyyagh-Albouz, S., Mensah, M. L., ... and Loiseau, P. M. (2016). Antiplasmodial activity of selected medicinal plants used to treat malaria in Ghana. *Parasitology Research*, 115(8): 3185-3195.

Konyalıoğlu, S., Sağlam, H., and Kıvçak, B. (2005). α-tocopherol, flavonoid, and phenol contents and antioxidant activity of *Ficus carica* leaves. *Pharmaceutical Biology*, 43(8): 683-686.

Lako, J., Trenerry, V. C., Wahlqvist, M., Wattanapenpaiboon, N., Sotheeswaran, S., and Premier, R. (2007). Phytochemical flavonols, carotenoids and the antioxidant properties of a wide selection of Fijian fruit, vegetables and other readily available foods. *Food Chemistry,* 101(4): 1727-1741.

Laskar, R. A., Sk, I., Roy, N., and Begum, N. A. (2010). Antioxidant activity of Indian propolis and its chemical constituents. *Food Chemistry*, 122(1): 233-237.

Lau, K. Y., Zainin, N. S., Abas, F., and Rukayadi, Y. (2014). Antibacterial and sporicidal activity of *Eugenia polyantha* Wight against *Bacillus cereus* and *Bacillus subtilis*. *International Journal of Current Microbiology and Applied Sciences*, 3(1): 499-510.

Lauridsen, L., and Knøchel, S. (2003). Microbiological stability and diversity in raw pre-peeled potatoes packed in different atmospheres. *European Food Research and Technology*, 217(5): 421-426.

Law, J. W. F., Letchumanan, V., Chan, K. G., Goh, B. H., and Lee, L. H. (2016). Insights into detection and identification of foodborne pathogens. In Singh, O. V. (Ed.), *Food Borne Pathogens and Antibiotic Resistance* (pp. 153-201). Wiley Online Library.

Lazarova, R. and Krystallis, A. (2010). *Consumer's perception of food quality and its relation to the choice of food*. Department of Marketing and Statistics. Aarhus Universitet.

Lee, H., Kim, J., Nam, H. S., Choi, J., Lee, D., Park, S., ... and Park, J. (2020). Case report for a large-scale food poisoning outbreak that occurred in a group food service center in Chungnam, Korea. *Journal of Environmental Health Sciences*, 46(5): 525-531.

Lee, M. (2009). *Basic skills in interpreting laboratory data: fourth edition*. American Society of Health-System Pharmacist, Inc. USA.

Leifert, C., Ball, K., Volakakis, N. and Cooper, J.M. (2008). Control of enteric pathogens in ready-to-eat vegetable crops in organic in low input production system: a HACCP-based approach. *Journal of Applied Microbiology*, 105(4): 931-950.

Letchumanan, V., Loo, K. Y., Law, J. W. F., Wong, S. H., Goh, B. H., Ab Mutalib, N. S., and Lee, L. H. (2019). *Vibrio parahaemolyticus*: The protagonist of foodborne diseases. *Progress In Microbes and Molecular Biology*, *2*(1): 1-8.

Li, X. M., Luo, X. G., Wang, N., Zhou, H., Si, C. L., Li, K., ... and Zhang, T. C. (2015). The extract of *Hypericum ascyron* L. induces bacterial cell death through apoptosis pathway. *Journal of Ethnopharmacology*, 166(1): 205-210.

Li, Z. J., Wang, P., Jiang, C. Y., Cui, P. F. and Zhang, S. C. Li, Z., Wang, P., Jiang, C., Cui, P., and Zhang, S. (2016). Antibacterial activity and modes of action of phosvitin-derived peptide Pt5e against clinical multi-drug resistance bacteria. *Fish and Shellfish Immunology*, 58(8): 370-379.

Lianou, A., Panagou, E. Z., and Nychas, G. J. (2016). *The stability and shelf life of food*. Woodhead Publishing Elsevier.

Lim, A. S. L., and Rabeta, M. S. (2013). Proximate analysis, mineral content and antioxidant capacity of milk apple, Malay apple and water apple. *International Food Research Journal*, 20(2): 673-679.

Lima, M. C., de Sousa, C. P., Fernandez-Prada, C., Harel, J., Dubreuil, J. D., and De Souza, E. L. (2019). A review of the current evidence of fruit phenolic compounds as potential antimicrobials against pathogenic bacteria. *Microbial Pathogenesis*,130(1): 259-270.

Liu, W., and Liu, Y. (2016). Youyou Tu: significance of winning the 2015 Nobel Prize in physiology or medicine. *Cardiovascular Diagnosis and Therapy*, 6(1): 1–2.

Liu, W., Fu, X., and Li, Z. (2019). Extraction of tocopherol from soybean oil deodorizer distillate by deep eutectic solvents. *Journal of Oleo Science*, 68(10): 951-958.

Logan, N. A. (2012). *Bacillus* and relatives in foodborne illness. *Journal of Applied Microbiology*, 112(3): 417-429.

Logan, P., and Collins, S. (2014). PDA survey of medical residents: e-books before e-mail. *Journal of the Canadian Health Libraries Association / Journal De l'Association Des bibliothèques De La Santé Du Canada*, 30(1): 3–10.

Loganathan, V., Devi, K. M., and Selvakumar, P. (2017). A study of the physico-chemical and phytochemical parameters of leaves of *Mallotus rhamnifolius*. *International Journal of Pharmacognosy and Phytochemical Research*, 9(6): 858-863.

Lourenço, S. C., Moldão-Martins, M., and Alves, V. D. (2019). Antioxidants of natural plant origins: from sources to food industry applications. *Molecules (Basel, Switzerland),* 24(22): 4132-4157.

Lozano-Grande, M. A., Gorinstein, S., Espitia-Rangel, E., Dávila-Ortiz, G., and Martínez-Ayala, A. L. (2018). Plant sources, extraction methods, and uses of squalene. *International Journal of Agronomy*, 2018(1): 1-14.

Lü, J. M., Lin, P. H., Yao, Q., and Chen, C. (2010). Chemical and molecular mechanisms of antioxidants: experimental approaches and model systems. *Journal of Cellular and Molecular Medicine*, 14(4): 840-860.

Luo, K., Kim, S. Y., Wang, J., and Oh, D. H. (2016). A combined hurdle approach of slightly acidic electrolyzed water simultaneous with ultrasound to inactivate *Bacillus* cereus on potato. *LWT - Food Science and Technology*, 73(1), 615-621.

Lynch, M.F., Tauxe, R.V. and Hedberg, C.W. (2009). The growing burden of foodborne outbreaks due to contaminated fresh produce: risks and opportunities. *Epidemiology of Infections,* 137(1): 307-315.

MacDonald, R., and Reitmeier, C. (2017). *Understanding food systems: agriculture, food science, and nutrition in the United States*. Academic Press.

Madhushika, C., and Udukala (2021). *In vitro* comparison of pharmacological properties of *Syzygium jambos, Syzygium malaccense* and *Syzygium samarangense* species in Sri Lanka, extracted with different solvents. *Journal of Innovations in Pharmaceutical and Biological Sciences,* 8(1): 08-13

Magkos, F., Arvaniti, F., and Zampelas, A. (2006). Organic food: buying more safety or just peace of mind? A critical review of the literature. *Critical Reviews in Food Science and Nutrition*, 46(1): 23-56.

Malawani, A. D., Nuneza, O. M., Uy, M. M., and Senarath, W. T. (2017). Ethnobotanical survey of the medicinal plants used by the Maranaos in Pualas, Lanao del Sur, Philippines. *Bulletin of Environment, Pharmacology and Life Sciences*. 6(6): 45-53.

Malek, M., Acharjee, M., and Rahman, T. (2013). Microbiological profile of potato samples collected from Bangladesh agricultural research institute (BARI) and notification of anti-bacterial traits. *Stamford Journal of Microbiology*, 3(1): 21-25.

Malik, M. N., Fenko, M. D., Shiekh, A. M., and Wisniewski, H. M. (1997). Isolation of α-tocopherol (vitamin E) from garlic. *Journal of Agricultural and Food Chemistry*, 45(3): 817-819.

Mallet, J. F., Cerrati, C., Ucciani, E., Gamisans, J., and Gruber, M. (1994). Antioxidant activity of plant leaves in relation to their alpha-tocopherol content. *Food Chemistry*, 49(1): 61-65.

Mamman, P. H., Mshelia, W. P., Susbatrus, S. C. and Sambo. K. (2013). Antibacterial effects of crude extract of *Azadirachta indica* against *Escherichia coli*, *Salmonella* sp. and *Staphylococcus aureus*. *International Journal of Medicine and Medical Sciences*, 5(1): 14-18.

Manilal, A., Sujith, S., Kiran, G. S., Selvin, J., and Shakir, C. (2009). Cytotoxic potentials of red alga, *laurencia brandenii,* collected from the Indian coast. *Global Journal of Pharmacology*, 3(2): 90-94.

Martins, F. C., Sentanin, M. A., and De Souza, D. (2021). Categories of food additives and analytical techniques for their determination. In Galanakis, C. M. (Ed.), *Innovative Food Analysis* (pp. 123-156), Academic Press.

Mazid, M. A., Datta, B. K., Nahar, L., and Sarker, S. D. (2008). Assessment of anti-bacterial activity and brine-shrimp toxicity of two *Polygonum* species. *Ars Pharmaceutica*, 49(2): 127-134.

McDonnell, G. and Russell, A.D. (1999). Antiseptics and disinfectants: activity, action and resistance. *Clinical Microbiology Reviews,* 12(1): 147-79.

McGaw, L. J., Jäger, A. K., and Van Staden, J. (2002). Antibacterial effects of fatty acids and related compounds from plants. *South African Journal of Botany*, 68(4): 417-423.

Medina, E., and Pieper, D. H. (2016). Tackling threats and future problems of multidrug-resistant bacteria. *Current Topics in Microbiology and Immunology*, 398(1): 3-33.

Méndez-Vilas, A. (2013). *Microbial pathogens and strategies for combating them: science, technology and education*. Formatex Research Center.

Meng, J., and Doyle, M. P. (1998). Emerging and evolving microbial foodborne pathogens. *Bulletin de l'Institut Pasteur*, 96(3): 151-163.

Meng, Z., XuChu, C., HuiXia, Y., XiaoLi, D., ZhiGang, C., WeiLi, L., and ZhaoRui, C. (2015). Laboratory diagnosis and analysis of a food poisoning outbreak caused by *Salmonella*. *Disease Surveillance*, 30(5): 381-384.

Mensah, M. L., Komlaga, G., Forkuo, A. D., Firempong, C., Anning, A. K., and Dickson, R. A. (2019). Toxicity and safety implications of herbal medicines used in Africa. *Herbal Medicine*, 63(1): 1992-0849.

Meyer, B.N., Ferrigni, N.R., Putnam, J.E., Jascobsen, L.B., Nichols, D.E. and McLaughlin, J.L. (1982). Brine-shrimp: A convenient general bioassay for active plant constituents. *Planta Medica,* 45(1): 31-34.

Mgbakogu, R. A., and Eledo, B. O. (2015). Incidence, characterization and pathological features of *Bacillus cereus* in soil, raw cereals and meat in Anambra state, eastern Nigeria. *Journal of Natural Sciences Research*, 5(1): 1-16.

Michael, A. S., Thompson, C. G., and Abramovitz, M. (1956*). Artemia salina* as a test organism for bioassay. *Science*, 123(3194): 464-464.

Michailidis, P. A., and Krokida, M. K. (2014). Drying and dehydration processes in food preservation and processing. In Bhattacharya, S. (Ed.), *Conventional and Advanced Food Processing Technologies* (pp. 1-32). John Wiley and Sons.

Miguel, M. G. (2010). Antioxidant activity of medicinal and aromatic plants. A review. *Flavour and Fragrance Journal*, 25(5): 291-312.

Mikkola, R., Andersson, M. A., Teplova, V., Grigoriev, P., Kuehn, T., Loss, S., ... and Salkinoja-Salonen, M. S. (2007). Amylosin from *Bacillus amyloliquefaciens*, a K+ and Na+ channel-forming toxic peptide containing a polyene structure. *Toxicon*, 49(8): 1158-1171.

Miller, K. B., Hurst, W. J., Payne, M. J., Stuart, D. A., Apgar, J., Sweigart, D. S., and Ou, B. (2008). Impact of alkalization on the antioxidant and flavanol content of commercial cocoa powders. *Journal of Agricultural and Food Chemistry*, 56(18): 8527-8533.

Moawad, A. A., Hotzel, H., Awad, O., Tomaso, H., Neubauer, H., Hafez, H. M., and El-Adawy, H. (2017). Occurrence of *Salmonella enterica* and *Escherichia coli* in raw chicken and beef meat in northern Egypt and dissemination of their antibiotic resistance markers. *Gut Pathogens*, 9(1): 1-13.

Mohamed, A. A., Ali, S. I., and El-Baz, F. K. (2013). Antioxidant and antibacterial activities of crude extracts and essential oils of *Syzygium cumini* leaves. *PLOS One*, 8(4): e60269.

Morshedy, A.E.M.A. and Sallam, K.I. (2009). Improving the microbial quality and shelf life of chicken carcasses by trisodium phosphate and lactic acid dipping. *International Journal of Poultry Science,* 8(1): 645-650.

Mostaqim, S., Saha, S. K., Hani, U., Paul, S. K., Sharmin, M., Basak, S., ... and Shahabuddin, M. S. (2019). Antibacterial activities of clove (*Syzygium aromaticum*) extracts against three food borne pathogens: *Staphylococcus aureus, Escherichia coli* and *Pseudomonas aeruginosa*. *Mymensingh Medical Journal: MMJ*, 28(4): 779-791.

Müller, M., Hammann, S., and Vetter, W. (2018). Countercurrent chromatographic isolation and purification of 11′-α-tocomonoenol from the vitamin E extract of palm oil. *Food Chemistry*, 256(1): 327-332.

Murata, A., Sekiya, K., Watanabe, Y., Yamaguchi, F., Hatano, N., Izumori, K., and Tokuda, M. (2003). A novel inhibitory effect of D-allose on production of reactive oxygen species from neutrophils. *Journal of Bioscience and Bioengineering*, 96(1): 89-91.

Murthy, H. N., and Bapat, V. A. (2019). *Bioactive Compounds in Underutilized Fruits and Nuts*. New York, NY: Springer International Publishing.

Mustaqim, A. W. (2020). *Syzygium malaccense (L.) Merr. & L.M.Perry Myrtaceae*. Springer Link

Muzaffar, S., Bose, C., Banerji, A., Nair, B. G., and Chattoo, B. B. (2016). Anacardic acid induces apoptosis-like cell death in the rice blast fungus *Magnaporthe oryzae*. *Applied Microbiology and Biotechnology*, 100(1): 323-335.

Nagoor Meeran, M. F., Goyal, S. N., Suchal, K., Sharma, C., Patil, C. R., and Ojha, S. K. (2018). Pharmacological properties, molecular mechanisms, and pharmaceutical development of asiatic acid: a pentacyclic triterpenoid of therapeutic promise. *Frontiers in Pharmacology*, 9(1): 892-985.

Naidu, A. S. (2000). *Natural food antimicrobial systems*. CRC press.

Namuli, A., Abdullah, N., Sieo, C. C., Zuhainis, S. W. and Oskoueian, E. (2011). Phytochemical compounds and antibacterial activity of *Jatropha curcas* Linn. extracts. *Journal of Medicinal Plants Research*, 5(16): 3982-3990.

Nazareth, T. C., Zanutto, C. P., Tripathi, L., Juma, A., Maass, D., de Souza, A. A. U., ... and Banat, I. M. (2020). The use of low-cost brewery waste product for the production of surfactin as a natural microbial biocide. *Biotechnology Reports*, 28(1): e00537.

Negi, P.S. (2012). Plant extracts for the control of bacterial growth: Efficacy, stability and safety issues for food application. *International Journal of Food Microbiology*, 156(1): 7-17.

Neopane, P., Nepal, H. P., Shrestha, R., Uehara, O., and Abiko, Y. (2018). *In vitro* biofilm formation by *Staphylococcus aureus* isolated from wounds of hospital-admitted patients and their association with antimicrobial resistance. *International Journal of General Medicine,* 11(1): 25-32.

Newman, D. J., and Cragg, G. M. (2016). Natural products as sources of new drugs from 1981 to 2014. *Journal of Natural Products*. 79(3): 629-661.

Nguyen, V. T., and Scarlett, C. J. (2016). Mass proportion, bioactive compounds and antioxidant capacity of carrot peel as affected by various solvents. *Technologies*, 4(4): 36-49.

Nieto G. (2020). How Are Medicinal Plants Useful When Added to Foods? *Medicines Basel, Switzerland,* 7(9): 58-63.

Nigam, V., and Nigam, R. (2012). Distribution and medicinal properties of *Syzygium* species. *Current Research in Pharmaceutical Sciences*, 2(2): 73-80.

Nishiura, H. (2012). Early detection of nosocomial outbreaks caused by rare pathogens: a case study employing score prediction interval. *Osong Public Health and Research Perspectives*, 3(3): 121-127.

Nitiema, L.W., Savadogo, A., Simpore, J., Dianou, D. and Traore, A.S. (2012). *In vitro* antimicrobial activity of some phenolic compounds (coumarin and quercetin) against gastroenteritis bacterial strains. *International Journal of Microbiological Research*, 3(3): 183-187.

Noorlis, A., Ghazali, F. M., Cheah, Y. K., Tuan Zainazor, T. C., Wong, W. C., Tunung, R., ... and Son, R. (2011). Antibiotic resistance and biosafety of *Vibrio cholerae* and *Vibrio parahaemolyticus* from freshwater at retail level. *International Food Research Journal*, 18(4): 1523-1530.

Novak, K. M. (2005). Drug facts and comparisons. *Missouri: Wolters Kluwer Health*, 11(2): 217-22.

Novoslavskij, A., Terentjeva, M., Eizenberga, I., Valciņa, O., Bartkevičs, V., and Bērziņš, A. (2016). Major foodborne pathogens in fish and fish products: a review. *Annals of Microbiology,* 66(1): 1-15.

Nunes, P. C., Aquino, J. D. S., Rockenbach, I. I., and Stamford, T. L. M. (2016). Physico-chemical characterization, bioactive compounds and antioxidant activity of Malay apple [*Syzygium malaccense* (L.) Merr. and LM Perry]. *PloS One*, 11(6): e0158134.

Nyenje, M. E., and Ndip, N. (2013). The challenges of foodborne pathogens and antimicrobial chemotherapy: A global perspective. *African Journal of Microbiology Research*, 7(14): 1158-1172.

Nyenje, M.E., Odjadjare, C.E., Tanih, N.F., Green, E. and Ndip, R.N. (2012). Foodborne pathogens recovered from ready-to-eat foods from roadside cafeterias and retail outlets in Alice, Eastern Cape Province, South Africa: public health implications. *International Journal of Environmental Research Public Health*, 9(1): 2608-2619.

Oki, T., Masuda, M., Furuta, S., Nishiba, Y., Terahara, N., and Suda, I. (2002). Involvement of anthocyanins and other phenolic compounds in radical-scavenging activity of purple-fleshed sweet potato cultivars. *Journal of Food Science*, 67(5): 1752-1756.

Oliveira, A. M. D., Humberto, M. M. D. S., Silva, J. M. D., Rocha, R. D. F. D. A., and Sant'Ana, A. E. G. (2006). Estudo fitoquímico e avaliação das atividades moluscicida e larvicida dos extratos da casca do caule e folha de *Eugenia malaccensis* L.(Myrtaceae). *Revista Brasileira de Farmacognosia*. 16(1): 618-624.

Onyebuchi, C., and Kavaz, D. (2020). Effect of extraction temperature and solvent type on the bioactive potential of *Ocimum gratissimum* L. extracts. *Scientific Reports*, 10(1): 1-11.

Osman, H., Rahim, A. A., Isa, N. M., and Bakhir, N. M. (2009). Antioxidant activity and phenolic content of *Paederia foetida* and *Syzygium aqueum*. *Molecules*, 14(3): 970-978.

Padalia, H., and Chanda, S. (2015). Antimicrobial efficacy of different solvent extracts of Tagetes erecta L. flower, alone and in combination with antibiotics. *Applied Microbiology: open access*, 1(1): 1-10.

Papuc, C., Goran, G. V., Predescu, C. N., Nicorescu, V. and Stefan, G. Plant polyphenols as antioxidant and antibacterial agents for shelf-life extension of eat and meat products: Classification, structures, sources, and action mechanisms. *Comprehensive Reviews in Food Science and Food Safety,* 16(6): 1243–1268 (2017).

Pariyani, R., Safinar Ismail, I., Azam, A. A., Abas, F., Shaari, K., and Sulaiman, M. R. (2015). Phytochemical screening and acute oral toxicity study of Java tea leaf extracts. *BioMed Research International*, 2015(1): 1-8.

Park, K. M., Yoon, S. G., Choi, T. H., Kim, H. J., Park, K. J., and Koo, M. (2020). The bactericidal effect of a combination of food-grade compounds and their application as alternative antibacterial agents for food contact surfaces. *Foods*, 9(1): 59.

Parlapani, F. F., Mallouchos, A., Haroutounian, S. A., and Boziaris, I. S. (2017). Volatile organic compounds of microbial and non-microbial origin produced on model fish substrate un-inoculated and inoculated with gilt-head sea bream spoilage bacteria. *LWT - Food Science and Technology*, 78(1): 54-62.

Pateiro, M., Munekata, P. E., Sant'Ana, A. S., Domínguez, R., Rodríguez-Lázaro, D., and Lorenzo, J. M. (2021). Application of essential oils as antimicrobial agents against spoilage and pathogenic microorganisms in meat products. *International Journal of Food Microbiology*, 337(1): 1-13.

Paydar, M., Teh, C. S. J., and Thong, K. L. (2013). Prevalence and characterisation of potentially virulent *Vibrio parahaemolyticus* in seafood in Malaysia using conventional methods, PCR and REP-PCR. *Food Control*, 32(1): 13-18.

Peng, F. M., Jiang, D. Y., Ruan, H. H., Liu, H. Q., and Zhou, L. P. (2010). Pathogenic investigation on a food poisoning induced by *Vibrio parahaemolyticus*. *Preventive Medicine Tribune*. 16(8): 746-747.

Perez-Gregorio, M. R., Gonzalez-Barreiro, C., Rial-Otero, R., Simal-Gándara, J. (2011). Comparison of sanitizing technologies on the quality appearance and antioxidant levels in onion slices. *Food Control*, 22(1): 2052-2058.

Petruzzi, L., Corbo, M. R., Sinigaglia, M., and Bevilacqua, A. (2017). Microbial spoilage of foods: Fundamentals. In Bevilacqua, A., Rosaria, M. C., and Sinigaglia, M. (Ed.), *The microbiological quality of food* (pp. 1-21). Woodhead Publishing.

Phillips, C.A. (2001). *Arcobacter* sp. in food: isolation, identification and control. *Trend in Food Science and Technology*, 12(8): 263-275.

Pizato, S., Cortez-Vega, W.R. and Prentice, C. (2015). Quality assessment of cooked chicken breast meat at different storage temperatures. *International Food Research Journal,* 22(1): 143-154.

Poonja, A., Heirali, A., Workentine, M., Storey, D. G., Somayaji, R., Rabin, H. R., ... and Parkins, M. D. (2017). Effect of freezing sputum on *Pseudomonas aeruginosa* population heterogeneity. *Journal of Cystic Fibrosis*, 16(3): 353-357.

Prasad, S. K., Kulshreshtha, A., and Qureshi, T. N. (2009). Antidiabetic activity of some herbal plants in streptozotocin induced diabetic albino rats. *Pakistan Journal of Nutrition*, 8(5): 551-557.

Pullaiah, T. (2006). *Encyclopaedia of World Medicinal Plants*. Regency Publications.

Purushothaman, A. Sudhir, A.S. Joby, G. Aravind, R. and Varghese, A. (2015). A study on antimicrobial and anthelmintic activity of methanolic leaf extracts of *Syzygium malaccense* (L.) Merr. and Perry. *Journal of Chemical and Pharmaceutical Research*, 7(4): 838-841.

Puspanadan, S., Afsah-Hejri, L., Loo, Y. Y., Nillian, E., Kuan, C. H., Goh, S. G., ... and Son, R. (2012). Detection of *Klebsiella pneumoniae* in raw vegetables using Most Probable Number-polymerase Chain Reaction (MPN-PCR). *International Food Research Journal*, 19(4): 1757-1762.

Qian, S., Lu, H., Sun, J., Zhang, C., Zhao, H., Lu, F., ... and Lu, Z. (2016). Antifungal activity mode of *Aspergillus ochraceus* by bacillomycin D and its inhibition of ochratoxin A (OTA) production in food samples. *Food Control*, 60(1): 281-288.

Rabeta, M. S., Chan, S., Neda, G. D., Lam, K. L., and Ong, M. T. (2013). Anticancer effect of underutilized fruits. *International Food Research Journal*, 20(2): 551.

Radünz, M., da Trindade, M. L. M., Camargo, T. M., Radünz, A. L., Borges, C. D., Gandra, E. A., and Helbig, E. (2019). Antimicrobial and antioxidant activity of unencapsulated and encapsulated clove (*Syzygium aromaticum*, L.) essential oil. *Food Chemistry*, 276(5): 180-186.

Rahman, M. S. (2020). Food Preservation: An Overview. In Rahman, M. S. (Ed.), *Handbook of food preservation* (pp. 7-18). CRC press.

Raj, S., Vinod, V., Jayakumar, J., Suresh, P., Kumar, A., and Biswas, R. (2021). Antifungal activity of *Syzygium samarangense* leaf extracts against *Candida*. *Letters in Applied Microbiology*, 73(1): 31-38.

Ramadhania, Z. M., Insanu, M. U. H. A. M. A. D., Gunarti, N. S., Wirasutisna, K. R., Sukrasno, S. U. K. R. A. S. N. O., and Hartati, R. I. K. A. (2017). Antioxidant activity from ten species of myrtaceae. *Asian Journal of Pharmaceutical and Clinical Research*, 10(14): 5-7.

Ramli, S., Radu, S., Shaari, K., and Rukayadi, Y. (2017). Antibacterial activity of ethanolic extract of *Syzygium polyanthum* L.(Salam) leaves against foodborne pathogens and application as food sanitizer. *BioMed Research International*, 2017(2): 1-13.

Ranghoo-Sanmukhiya, V. M., Chellan, Y., Govinden-Soulange, J., Lambrechts, I. A., Stapelberg, J., Crampton, B., and Lall, N. (2019). Biochemical and phylogenetic analysis of *Eugenia* and *Syzygium* species from Mauritius. *Journal of Applied Research on Medicinal and Aromatic Plants*, 12(1): 21-29.

Ravi, L., Girish, S., Harshini, M., and Sreenivas, B. K. A. (2020). β-Sitosterol: An antibacterial agent in aquaculture management of *Vibrio* infections. *Journal of Pure and Applied Microbiology*, 14(4): 2699-2714.

Rawat, S. (2015). Food spoilage: Microorganisms and their prevention. *Asian Journal of Plant Science and Research*, 5(4): 47-56.

Razzaq, R., Farzana, K., Mahmood, S. and Murtaza, G. (2014). Microbiological analysis of street vended vegetables in Multan city, Pakistan: A public health concern. *Pakistan Journal of Zoology*, 46(4): 1133-1138.

Reddick, E. (2017). Investigation of salmonellosis outbreak following a hospital endoscopy: A public health case study. *Canadian Journal of Infection Control*, *32*(3): 156-159.

Ren, X., An, P., Zhai, X., Wang, S., and Kong, Q. (2019). The antibacterial mechanism of pterostilbene derived from Xinjiang wine grape: A novel apoptosis inducer in *Staphylococcus aureus* and *Escherichia coli*. *LWT - Food Science and Technology*, 101(3): 100-106.

Reynertson, K. A. (2007). *Phytochemical analysis of bioactive constituents from edible Myrtaceae fruits.* Doctoral dissertation, City University of New York.

Rezaeian, S., Attaran, S., and Pourianfar, H. R. (2016). Time-kill kinetics and antibacterial activity of crude methanolic extract of *Thymus daenensis* Celak. *Biomedical Research,* 27(2): 489-493.

Riaz, A., Rasul, A., Hussain, G., Zahoor, M. K., Jabeen, F., Subhani, Z., ... and Selamoglu, Z. (2018). Astragalin: a bioactive phytochemical with potential therapeutic activities. *Advances in Pharmacological Sciences*, 2018(1): 1-15.

Rinai, K.R., Ismail, I.S., Son, R., New, C.Y. and Rukayadi, Y. (2020). Antibacterial and antioxidant activities of *Homalomena josefii* P.C. Boyce and S.Y. Wong rhizome extract. *Food Research*, 4(6). 2122-2131.

Roedig-Penman, A., and Gordon, M. H. (1998). Antioxidant properties of myricetin and quercetin in oil and emulsions. *Journal of the American Oil Chemists' Society*, *75*(2): 169-180.

Rohman, A., Riyanto, S., Yuniarti, N., Saputra, W. R., Utami, R., and Mulatsih, W. (2010). Antioxidant activity, total phenolic, and total flavaonoid of extracts and fractions of red fruit (*Pandanus conoideus* Lam). *International Food Research Journal*, 17(1): 97-106.

Romes, N. B., Wahab, R. A., and Hamid, M. A. (2019). Proximate analysis and bioactivity study on acoustically isolated *Elaeis guineensis* leaves extract. In *AIP Conference Proceedings*, 2155(1): p. 020001. AIP Publishing LLC.

Rosen, T., and Fordice, D. B. (1994). Cashew nut dermatitis. *Southern Medical Journal*, *87*(4): 543-546.

Rukayadi, Y. and Hwang, J.K. (2006). *In vitro* activity of xanthorrhizol against *Streptococcus mutans* biofilms. *Letters in Applied Microbiology,* 42: 400-404.

Rukayadi, Y., Lau, K.Y., Zainin, N.S., Zakaria, M. and Abas, F. (2013). Screening of antimicrobial activity of tropical edible medicinal plant extracts against five standard microorganisms for natural food preservatives. *International Food Research Journal,* 20(5): 2905-2910.

Ryan, M. P., O'Dwyer, J., and Adley, C. C. (2017). Evaluation of the complex nomenclature of the clinically and veterinary significant pathogen *Salmonella*. *BioMed Research International*, 2017(4): 1-6.

Saeed, F., Afzaal, M., Tufail, T., and Ahmad, A. (2019). Use of natural antimicrobial agents: a safe preservation approach. *Active Antimicrobial Food Packaging*, 18(0): 1-18

Saeidnia, S., Manayi, A., Gohari, A. R., and Abdollahi, M. (2014). The story of beta-sitosterol-a review. *European Journal of Medicinal Plants*, 4(5): 590-609.

Saikia, L., Sharma, A., Nath, R., Choudhury, G., and Borah, A. K. (2015). *Salmonella* Weltevreden food poisoning in a tea garden of Assam: An outbreak investigation. *Indian Journal of Medical Microbiology*, 33(4): 503-506.

Salleh, W., Lani, M. N., Abdullah, W. W., Chilek, T. Z. T., and Hassan, Z. A.I. (2017). A review on incidences of foodborne diseases and interventions for a better national food safety system in Malaysia. *Malaysian Applied Biology*, 46(3): 1-7.

Samtiya, M., Aluko, R. E., Dhewa, T., and Moreno-Rojas, J. M. (2021). Potential health benefits of plant food-derived bioactive components: An overview. *Foods*, 10(4): 839-864.

Santos-Sánchez, N. F., Salas-Coronado, R., Villanueva-Cañongo, C., and Hernández-Carlos, B. (2019). *Antioxidant compounds and their antioxidant mechanism* (pp. 1-28). London, UK: IntechOpen.

Saptarini, N. M., and Herawati, I. E. (2017). Antioxidant activity of water apple (*Syzygium aqueum*) fruit and fragrant mango (*Mangifera odorata*) fruit. *Asian Journal of Pharmaceutical and Clinical Research*, 10(14): 54-56.

Sarah, Q. S., Anny, F. C., and Mir, M. (2017). Brine-shrimp lethality assay. *Bangladesh Journal of Pharmacology*, 12(2): 186-189.

Saroj, S. D., Shashidhar, R., Dhokane, V., Hajare, S., Sharma, A., and Bandekar, J. R. (2006). Microbiological evaluation of sprouts marketed in Mumbai, India, and its suburbs. *Journal of Food Protection*, 69(10): 2515-2518.

Sasirekha, B., Megha, D. M., Chandra, M. S., and Soujanya, R. (2015). Study on effect of different plant extracts on microbial biofilms. *Asian Journal of Biotechnology*, 7(1): 1-12.

Saura-Calixto, F., and Goñi, I. (2006). Antioxidant capacity of the Spanish Mediterranean diet. *Food Chemistry*, 94(3): 442-447.

Savi, A., Calegari, M. A., Calegari, G. C., Santos, V. A. Q., Wermuth, D., da Cunha, M. A. A., and Oldoni, T. L. C. (2020). Bioactive compounds from *Syzygium malaccense* leaves: optimization of the extraction process, biological and chemical characterization. *Acta Scientiarum. Technology*, 42(1): e46773-e46773.

Savitha, R. C., Padmavathy, S., and Sundhararajan, A. (2011). *In vitro* antioxidant activities on leaf extracts of *Syzygium malaccense* (L.) Merr and Perry. *Ancient Science of Life*, 30(4): 110.

Saxena, M., Saxena, J., Nema, R., Singh, D., and Gupta, A. (2013). Phytochemistry of medicinal plants. *Journal of Pharmacognosy and Phytochemistry*, 1(6): 168-182.

Schelin, J., Wallin-Carlquist, N., Thorup Cohn, M., Lindqvist, R., and Barker, G. C. (2011). The formation of *Staphylococcus aureus* enterotoxin in food environments and advances in risk assessment. *Virulence*, 2(6): 580-592.

Schultz, D. J., Wickramasinghe, N. S., and Klinge, C. M. (2006). Anacardic acid biosynthesis and bioactivity. In Romeo, J. T. (Ed.), *Recent Advances in Phytochemistry* (pp. 131-156). Elsevier.

Semwal, D. K., Semwal, R. B., Combrinck, S., and Viljoen, A. (2016). Myricetin: A dietary molecule with diverse biological activities. *Nutrients*, 8(2): 90.

Sen, A., Dhavan, P., Shukla, K. K., Singh, S., and Tejovathi, G. (2012). Analysis of IR, NMR and antimicrobial activity of β-sitosterol isolated from *Momordica charantia*. *Science Secure Journal of Biotechnology*, 1(1): 9-13.

Seo, D. Y., Lee, S. R., Heo, J. W., No, M. H., Rhee, B. D., Ko, K. S., ... and Han, J. (2018). Ursolic acid in health and disease. *The Korean Journal of Physiology and Pharmacology*, 22(3): 235-248.

Sethi, V. (2017). *Unit-6 Chemicals for Controlling Microorganism*. The Indira Gandhi National Open University

Shah, M. M., Miringu, G., Wada, A., Kaneko, S., and Ichinose, Y. (2019). Case report: *Bacillus pumilus*–caused bacteremia in a patient with food poisoning. *The American Journal of Tropical Medicine and Hygiene*, 100(3): 688-690.

Shahidi, F. (2015). *Handbook of antioxidants for food preservation*. Woodhead Publishing.

Shahraki, E. (2013). Antioxidant activity of *Polygonum patulum* M. Bieb. *Phytoscience*, 1(1): 1-5.

Sharma, R., Kishore, N., Hussein, A., and Lall, N. (2013). Antibacterial and anti-inflammatory effects of *Syzygium jambos* L. (Alston) and isolated compounds on acne vulgaris. *BMC Complementary and Alternative Medicine*, 13(1): 1-10.

Sharma, S. (2015). Food preservatives and their harmful effects. *International Journal of Scientific and Research Publications*, 5(4): 1-2.

Sherwin, E. R. (1990). Antioxidants. In Branen, A. L., Davidson, M. P., Salminen, S. (Ed.), *Food additives* (pp. 139-194). New York: Marcel Dekker.

Shi, H. (2021). Enzyme. In Garbutt, J. (Ed.), *Essentials of Food Chemistry* (pp. 327-381). Springer, Singapore.

Silhavy, T. J., Kahne, D., and Walker, S. (2010). The bacterial cell envelope. *Cold Spring Harbor Perspectives in Biology*, 2(5): a000414.

Simirgiotis, M. J., Adachi, S., To, S., Yang, H., Reynertson, K. A., Basile, M. J., ... and Kennelly, E. J. (2008). Cytotoxic chalcones and antioxidants from the fruits of *Syzygium samarangense* (Wax *Jambu*). *Food Chemistry*, 107(2): 813-819.

Singh, R. S., Singh, T., and Pandey, A. (2019). Microbial enzymes—an overview. *Advances in Enzyme Technology*, 2019(2): 1-40.

Sobeh, M., Mahmoud, M. F., Petruk, G., Rezq, S., Ashour, M. L., Youssef, F. S., ... and Wink, M. (2018). *Syzygium aqueum*: A polyphenol-rich leaf extract exhibits antioxidant, hepatoprotective, pain-killing and anti-inflammatory activities in animal models. *Frontiers in Pharmacology*, 9(1): 566-580.

Sodha, S. V., Heiman, K., Gould, L. H., Bishop, R., Iwamoto, M., Swerdlow, D. L., and Griffin, P. M. (2015). National patterns of *Escherichia coli* O157 infections, USA, 1996–2011. *Epidemiology and Infection*, 143(2): 267-273.

Soh, W. K. (2017). Taxonomy of *Syzygium*. In Nair, K. N. (Ed.), *The Genus Syzygium; Syzygium cumini and Other Underutilized Species* (pp. 1-5). New York: CRC press

Spacil, Z., Novakova, L. and Solich, P. (2010). Comparison of positive and negative ion detection of tea catechins using tandem mass spectrometry and ultrahigh performance liquid chromatography. *Food Chemistry*, 123(2): 535-541.

Srivastava, R.P. and Kumar, S. (2002). *Fruit and Vegetable Preservation: Principles and Practices.* Lucknow: International Book Distributing Co.

Stalin, N. (2018). Screening of phytochemical and pharmacological activities of *Syzygium caryophyllatum* (L.) Alston. *Clinical Phytoscience*, 4(1): 1-13.

Stein, R. A., and Chirilă, M. (2017). Routes of transmission in the food chain. *Foodborne Diseases*, 12(6): 65–103.

Stich, H. F. (1991). The beneficial and hazardous effects of simple phenolic compounds. *Mutation Research/Genetic Toxicology*, 259(3-4): 307-324.

Stillwell, W. (2013). Membrane transport. *An introduction to biological membranes*, 305. Elsevier Wordmark

Su, M., Liu, F., Luo, Z., Wu, H., Zhang, X., Wang, D., ... and Miao, Y. (2019). The antibacterial activity and mechanism of chlorogenic acid against foodborne pathogen *Pseudomonas aeruginosa*. *Foodborne Pathogens and Disease*, 16(12): 823-830.

Sui, L., Dong, Y., Watanabe, Y., Yamaguchi, F., Hatano, N., Izumori, K., and Tokuda, M. (2005). Growth inhibitory effect of D-allose on human ovarian carcinoma cells *in vitro*. *Anticancer Research*, 25(4): 2639-2644.

Sujeewa, A. K. W., Norrakiah, A. S., and Laina, M. (2009). Prevalence of toxic genes of *Vibrio parahaemolyticus* in shrimps (*Penaeus monodon*) and culture environment. *International Food Research Journal*, 16(1): 89-95.

Sun, C., Wu, Z., Wang, Z., and Zhang, H. (2015). Effect of ethanol/water solvents on phenolic profiles and antioxidant properties of Beijing propolis extracts. *Evidence-Based Complementary and Alternative Medicine*, 2015(1): 1-10.

Sun, Y. F., Song, C. K., Viernstein, H., Unger, F., and Liang, Z. S. (2013). Apoptosis of human breast cancer cells induced by microencapsulated betulinic acid from sour jujube fruits through the mitochondria transduction pathway. *Food Chemistry*, 138(2-3): 1998-2007.

Suominen, I., Andersson, M. A., Andersson, M. C., Hallaksela, A. M., Kämpfer, P., Rainey, F. A., and Salkinoja-Salonen, M. (2001). Toxic *Bacillus pumilus* from indoor air, recycled paper pulp, Norway spruce, food poisoning outbreaks and clinical samples. *Systematic and Applied Microbiology*, 24(2): 267-276.

Supardy, R., Afifah, N., Ibrahim, D., Sulaiman, S.F. and Zakaria, N.Z. (2012). Inhibition of *Klebsiella pneumoniae* ATCC 13883 by hexane extract of *Halimeda discoidea* (Decaisne) and the identification of its potential bioactive compounds. *Journal of Microbiology and Biotechnology,* 22(6): 872-881.

Swamy, T.A., Obey, J. and Mutuku, N.C. (2013). Phytochemical analysis of *Vernonia adoensis* leaves and roots used as a traditional medicinal plant in Kenya. *International Journal of Pharmaceutical and Biological,* 3(1): 46-52.

Syahmi, A.R.M., Vijayarathna, S., Sasidharan, S., Latha, L.Y., Kwan, Y.P., Lau, Y.L., Shin, L.N. and Chen, Y. (2010). Acute oral toxicity and brine-shrimp lethality of *Elaeis guineensis* Jacq. (oil palm leaf) methanol extract. *Molecules,* 15(2): 8111-8121.

Taguri, T., Tanaka, T., and Kouno, I. (2006). Antibacterial spectrum of plant polyphenols and extracts depending upon hydroxyphenyl structure. *Biological and Pharmaceutical Bulletin,* 29(11): 2226-2235.

Tao, N., Jia, L., and Zhou, H. (2014). Anti-fungal activity of Citrus reticulata Blanco essential oil against *Penicillium italicum* and *Penicillium digitatum*. *Food Chemistry*, 153(1): 265-271.

Taylor, J. M., Sutherland, A. D., Aidoo, K. E., and Logan, N. A. (2005). Heat-stable toxin production by strains of *Bacillus cereus, Bacillus firmus, Bacillus megaterium, Bacillus simplex* and *Bacillus licheniformis*. *FEMS Microbiology Letters*, 242(2): 313-317.

Taylor, S. L. (2017). Disease processes in foodborne illness. In Cliver, D. O., and Riemann, H. P. (Eds.), *Foodborne Diseases* (pp. 3-30). Academic Press.

Tetteh, A. W., Mensah, M. L., Boadu, K. O., Thomford, K. P., Agyemang, M. O., Annan, K., ... and Owusu-Ansah, E. D. (2017). Clinical evaluation of the safety and effectiveness of *Adutwumwaa Malamix*: a polyherbal product for the treatment of uncomplicated malaria in Ghana. *Journal of Applied Pharmaceutical Science*, 7(7): 40-45.

Tewari, A., and Abdullah, S. (2015). *Bacillus cereus* food poisoning: international and Indian perspective. *Journal of Food Science and Technology*, 52(5): 2500–2511

Tinh, T. H., Nuidate, T., Vuddhakul, V., and Rodkhum, C. (2016). Antibacterial activity of pyrogallol, a polyphenol compound against *Vibrio parahaemolyticus* isolated from the central region of Thailand. *Procedia Chemistry*, 18(1): 162-168.

Toa, N., Jia, L. and Zhou, H. (2014). Anti-fungal activity of *Citrus reticulata Blanco* essential oil against *Penicillium italicum* and *Penicillium digitatum*. *Food Chemistry*, 153(1): 265-271.

Tong, S. Y., Davis, J. S., Eichenberger, E., Holland, T. L., and Fowler Jr, V. G. (2015). *Staphylococcus aureus* infections: epidemiology, pathophysiology, clinical manifestations, and management. *Clinical Microbiology Reviews*, 28(3): 603-661.

Trombetta, D., Castelli, F., Sarpietro, M. G., Venuti, V., Cristani, M., Daniele, C., ... and Bisignano, G. (2005). Mechanisms of antibacterial action of three monoterpenes. *Antimicrobial Agents and Chemotherapy,* 49(6): 2474-2478.

Tukiran, Tukiran and Putri, D.O. (2021). Chemical profile by LC-MS analysis from the selected fraction of methanol extract of *Syzygium malaccense*. *Rasayan Journal of Chemistry*, 14(1): 295-305.

Turner, N. J., Whyte, R., Hudson, J. A., and Kaltovei, S. L. (2006). Presence and growth of *Bacillus cereus* in dehydrated potato flakes and hot-held, ready-to-eat potato products purchased in New Zealand. *Journal of Food Protection*, 69(5): 1173-1177.

Ugwah-Oguejiofor, C. J., Okoli, C. O., Ugwah, M. O., Umaru, M. L., Ogbulie, C. S., Mshelia, H. E., ... and Njan, A. A. (2019). Acute and sub-acute toxicity of aqueous extract of aerial parts of *Caralluma dalzielii* NE Brown in mice and rats. *Heliyon*, 5(1): e01179.

Ukuku, D.O. and Fett, W.E. (2004). Method of applying sanitizers and sample preparation affects recovery of native microflora and *Salmonella* on whole cantaloupe surfaces. *Journal of Food Protection,* 6(7): 999-1004.

Ullah, M. O., Haque, M., Urmi, K. F., Zulfiker, A. H., Anita, E. S., Begum, M., and Hamid, K. (2013). Anti-bacterial activity and brine-shrimp lethality bioassay of methanolic extracts of fourteen different edible vegetables from Bangladesh. *Asian Pacific Journal of Tropical Biomedicine*, 3(1): 1–7.

Ultee, A., Bennik, M. H. J. and Moezelaar, R. (2002). The phenolic hydroxyl group of carvacrol is essential for action against the food-borne pathogen *Bacillus cereus. Applied and Environmental Microbiology,* 68(4): 1561-1568.

Usta, A., and Demirkan, E. (2021). The effect of growth parameters on the antibiotic activity and sporulation in *Bacillus* sp. isolated from soil. *Journal of Microbiology, Biotechnology and Food Sciences*, 2021(1), 2310-2313.

Valtierra-Rodríguez, D., Heredia, N. L., García, S., and Sánchez, E. (2010). Reduction of *Campylobacter jejuni* and *Campylobacter coli* in poultry skin by fruit extracts. *Journal of Food Protection*. 73(3): 477-482.

Varghese, A. (2015). A study on antimicrobial and anthelmintic activity of methanolic leaf extracts of *Syzygium malaccense* (L.) Merr. and Perry. *Journal of Chemical and Pharmaceutical Research*, 7(4): 838-841.

Vermassen, A., Leroy, S., Talon, R., Provot, C., Popowska, M., and Desvaux, M. (2019). Cell wall hydrolases in bacteria: insight on the diversity of cell wall amidases, glycosidases and peptidases toward peptidoglycan. *Frontiers in Microbiology*, 10(1): 331.

Villaño, D., Fernández-Pachón, M. S., Moyá, M. L., Troncoso, A. M., and García-Parrilla, M. C. (2007). Radical scavenging ability of polyphenolic compounds towards DPPH free radical. *Talanta*, 71(1): 230-235.

Viuda-Martos, M., Mohamady, M. A., Fernández-López, J., Abd ElRazik, K. A., Omer, E. A., Pérez-Alvarez, J. A., and Sendra, E. (2011). *In vitro* antioxidant and antibacterial activities of essentials oils obtained from Egyptian aromatic plants. *Food Control*, 22(11): 1715-1722.

Wallace, G., and Fry, S. C. (1994). Phenolic components of the plant cell wall. *International Review of Cytology*, 151(1): 229-267.

Wardana, A. P., Hidayati, N., and Shimizu, K. (2018). An ellagic acid derivative and its antioxidant activity of chloroform extract of stem bark of *Syzygium polycephalum* Miq. (Myrtaceae). *Indonesian Journal of Chemistry*, 18(1): 26-34.

Wiegand, C., Abel, M., Ruth, P., Elsner, P., and Hipler, U. C. (2015). pH influence on antibacterial efficacy of common antiseptic substances. *Skin pharmacology and physiology*, 28(3): 147-158.

Wilson, L., Strohbehn, C., Domoto, P., Smith, M. A., Brehm-Stecher, B., and Mendonca, A. (2013). *Cleaning and Sanitizing Guide*. Ames: Lowa State University.

Witkowska, A.M., Hickey, D.K., Alonso-Gomez, M. and Wilkinson, M. (2013). Antimicrobial activity of commercial herb and spices extracts against selected foodborne bacteria. *Journal of Food Research,* 2(4): 37-54.

Wongwattanasathien, O., Kangsadalampai, K., and Tongyonk, L. (2010). Antimutagenicity of some flowers grown in Thailand. *Food and Chemical Toxicology*, 48(4): 1045-1051.

World Health Organization. (1998). Medicinal plants in the South Pacific: information on 102 commonly used medicinal plants in the South Pacific. WHO Regional Office for the Western Pacific.

Yang, S. C., Lin, C. H., Aljuffali, I. A., and Fang, J. Y. (2017). Current pathogenic *Escherichia coli* foodborne outbreak cases and therapy development. *Archives of Microbiology,* 199(6): 811-825.

Yff, B. T., Lindsey, K. L., Taylor, M. B., Erasmus, D. G., and Jäger, A. K. (2002). The pharmacological screening of *Pentanisia prunelloides* and the isolation of the antibacterial compound Palmitic acid. *Journal of Ethnopharmacology*, 79(1): 101-107.

Yi, S., Wang, W., Bai, F., Zhu, J., Li, J., Li, X., ... and He, Y. (2014). Antimicrobial effect and membrane-active mechanism of tea polyphenols against *Serratia marcescens*. *World Journal of Microbiology and Biotechnology*, 30(2), 451-460.

Yu, P., Yu, S., Wang, J., Guo, H., Zhang, Y., Liao, X., ... and Ding, Y. (2019). *Bacillus cereus* isolated from vegetables in China: incidence, genetic diversity, virulence genes, and antimicrobial resistance. *Frontiers in Microbiology*, 10(1): 948-958.

Yuniarni U, Sukandar E Y, and Fidrianny I. (2020). Antibacterial activity of several Indonesian plant extracts and combination of antibiotics with *Syzygium malaccense* extract as the most active substance. *International Journal of Research in Pharmaceutical Sciences*, 11(3): 3300-3308.

Yuniarni U, Sukandar E Y, and Fidrianny I. (2021). A perspective review of phytochemistry and pharmacology of the *Syzygium* genus. *International Journal of Research in Pharmaceutical Sciences,* 12(2): 1490-1495.

Yuniwati, E. D., and Prihartini, I. (2018). Production potential and product diversification to increase farmer's business capacity of *Gondang Manis* rose apple (*S. malaccense*) in Jombang Regency east Java. *Advances in Social Science, Education and Humanities Research*, 2018(1): 559-562.

Yusoff, N. A. H., Bustamam, M. S., Abas, F., Khatib, A., and Rukayadi, Y. (2014). Antimicrobial Activity of Cosmos caudatus Extract against foodborne pathogens. *Journal of Pure and Applied Microbiology*, 8(5): 3681-3688.

Yusoff, N.A.H., Noor, N.F. and Rukayadi, Y. (2015). Effects of *Cosmos caudatus* Kunth. (*Ulam raja*) extract on microflora in raw chicken meat. *International Journal of Current Microbiology and Applied Science,* 4(2): 426-435.

Zainin, N.S., Lau, K.Y., Zakaria, M., Son, R., Abdull Razis, A.F. and Rukayadi, Y. (2013). Antibacterial activity of *Boesenbergia rotunda* (L.) Mansf. A. extract against *Escherichia coli. International Food Research Journal*, 20(6): 3319-3323.

Zambelli, A. R., Aguiar, L. A., Cunha, A. P., Vieira, M. G. S., Cavalcanti, E. S. B., and Morais, S. M. (2006). *Avaliação do potencial antioxidante e análise do teor de taninos totais de Syzygium malaccense*. Anais da 58ª Reunião Anual da SBPC-Florianópolis.

Zemek, J., Linbk, K., Kadlečíková, B., Kučár, Š., and Somogyi, L. (1985). Antimicrobial effect of sugar osazones and anhydro sugars. *Folia Microbiologica*, 30(4): 396-399.

Zhang, H. Q., Barbosa-Cánovas, G. V., Balasubramaniam, V. B., Dunne, C. P., Farkas, D. F., and Yuan, J. T. (2011). *Nonthermal processing technologies for food*. Wiley Online Library.

Zhang, L. L., Zhang, L. F., and Xu, J. G. (2020). Chemical composition, antibacterial activity and action mechanism of different extracts from hawthorn (*Crataegus pinnatifida* Bge.). *Scientific Reports*, 10(1): 1-13.

Zhang, S. and J.M. Faber. (1996). The effects of various disinfectants against *Listeria monocytogenes* on fresh-cut vegetables. *Food Microbiology*, 13(1): 311- 321.

Zhang, S., Yang, G., Ye, Q., Wu, Q., Zhang, J., and Huang, Y. (2018). Phenotypic and genotypic characterization of *Klebsiella pneumoniae* isolated from retail foods in China. *Frontiers in Microbiology*, 9(1): 289-300.

Zhao, P., Ndayambaje, J. P., Liu, X., and Xia, X. (2020). Microbial spoilage of fruits: A review on causes and prevention methods. *Food Reviews International,* 2020(1): 1-22.

Zhao, S., Zhao, Q., Ye, H., Yanh, G., Li, J., and Hou, X. (2020). Investigation on a food poisoning caused by *Vibrio parahaemolyticus* and its aetiology. *Journal of Public Health and Preventive Medicine*, 2020(6): 113-117.

Zhao, Y., Wu, Y., and Wang, M. (2015). Bioactive substances of plant origin 30. In Cheung, P. C. K., and Mehta, B. M. (Ed.), *Handbook of food chemistry* (pp. 967-1008). Springer Berlin Heidelberg.

Zongo, C., Savadogo, A., Somda, K.M., Koudou, J. and Traore, A.S. (2011). *In vitro* evaluation of the antimicrobial and antioxidant properties of extracts from whole plant of *Alternanthera pungens* and leaves of *Combretum sericeum*. *International Journal of Phytomedicine*, 3(1): 182-191.

Zulcafli, A. S., Lim, C., Ling, A. P., Chye, S., and Koh, R. (2020). Focus: Plant-based medicine and pharmacology: antidiabetic potential of *Syzygium* sp.: An Overview. *The Yale Journal of Biology and Medicine*, 93(2): 307.