HERBS. SPICES AND MUSHROOM CHIPS COOKED WITH MICROWAVE AND ITS SENSORY EVALUATION

JAMILAH BINTI WAN HANAPI
DEPARTMENT OF NUTRITION SCIENCES, KULLIYYAH OF ALLIED HEALTH SCIENCES, INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, JLN SULTAN AHMAD SHAH BADER INDERA MAHKOTA 25200 KUANTAN, PAHANG, MALAYSIA
Jamilahwanhanapi1@gmail.com

MUHAMMAD MUZAFFAR ALI KHAN KHATTAK, PhD (CORRESPONDING AUTHOR)
DEPARTMENT OF NUTRITION SCIENCES, KULLIYYAH OF ALLIED HEALTH SCIENCES, INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, JLN SULTAN AHMAD SHAH BADER INDERA MAHKOTA 25200 KUANTAN, PAHANG, MALAYSIA
muzaffar@iium.edu.my

ABSTRACT

Introduction: The purpose of this paper was to develop a snack from mushroom which is mushroom chips that was marinated with herbs and spices for the IIUM students and to test its acceptability. **Methods:** Six formulations were prepared for sensory evaluation assessed by 34 untrained panellist consisted of IIUM Kuantan Students. Five sensory criteria that were tested in sensory evaluation include appearance, crispiness, taste, aroma and overall acceptance by using 9 points hedonic scale in order to test the Mushroom chips acceptability. All the collected data were analyzed using descriptive analysis, simple ANOVA and Post Hock test and the difference mean was regarded significant at 95 confidence intervals. **Results:** Out of the 5 criteria, only crispiness shows significance difference ($P<0.05$) where formulation 3 of mushroom chips was having the highest crispiness level compared to other formulations. The result also shows that the mushroom chips is equally acceptable to the panellists in terms of appearance, aroma, taste and overall acceptance **Conclusions:** Formulation 1 (without garlic) and 5 (without turmeric) showed the least acceptability out of 6 formulations. Formulation 3 (without ginger) has the highest acceptability among the panellist.

KEYWORDS: Mushroom, herbs, spices, sensory evaluation, chips

INTRODUCTION

People snacking because of hunger, availability of food and temptation. For example, it is common to eat popcorn while watching movies or while studying even in absence of feeling hungry. Healthy snacking is when you take food in a small amount and the snack is prepared with less oil, low in sugar and salts. However, some people may be snacking more and exceed their daily calories requirement. This happens maybe be because of the appetizing of the snacks and stress. Study by Ulrich-Lai, Fulton, Wilson, Petrovich, and Rinaman (2015) shows that intake of food that is palatable, high in sugars, carbohydrates and fats will increase when people are under stress. Ulrich-Lai and colleagues elaborate that the taste from these

types of foods will give consumers satisfying feeling hence, it is also address as comfort food. Garayo and Moreira (2002) mentioned that from the total sale of snacks in United States, potato chips represent 33 percent of it. This data shows that potato chips has become one of the favourite chips in America. Total sale of chips (banana, tapioca, corn, potato) in Malaysia during 2012 is approximately 34 million USD. Based on JAKPAT survey (2016), 29.52 % from 4234 respondents consumed snacks 2-3 times per week. The survey shows the higher intake of chips among respondents who were aged 20-35 years old. Junk food intake without limitation among consumers might lead to poor health condition such as obesity. This is because junk food is defined as food that has high amount in calories but little amount of nutritional values (Junk food, 1952) hence, overconsumption of high caloric food will lead to excess body weight. Potato is a high glycaemic index which will only sustain the feeling of fullness in a short time compare to moderate and low glycaemic index carbohydrates. Recently, people are pay attention to food safety and health issue. More initiatives should be done by food developers to provide healthier snacks to the consumer in the market. At the same time, snack must be acceptable in term of appearance, aroma, taste and appearance. Lawless and Haymann (1998) mentioned that taste is one of the criteria of sensory evaluation. The other criteria that also stated in the study are smell, texture and appearance. Sensory evaluation is widely used to assess acceptability of product from a targeted population. Generally, the authors explained that data created from human observers are remarkably changeable and there are some conditions where changes in human response that cannot be monitored in a sensory trial. The conditions are the mood and motivation, the physiological sensitivity to sensory stimulants and memories that the subjects had with the product or brands that has already available in the markets. Hence, this study will develop a new healthy snack product that is rich in nutrients and low in preservatives.

METHODS

In total of 35 untrained panelist (male and female) from International Islamic University Malaysia (IIUM) Kuantan campus was recruited. Inform consent was obtained from the volunteers. The use of adult subjects in sensory evaluation was necessary because of adult has ability to objectively evaluate the sensory characteristics of the formulations compared to children (Muhimbula, Issa-Zacharia, & Kinabo, 2011). Since this study design is non-purposive random sampling thus, there are a few inclusion and exclusion criteria thamust be met by the panellist; University students, Age between 19-26 and Did not have any problem with their sensory organ (mouth, nose). Each panellist was provided with 6 formulations, sensory evaluation paper and plain water for mouth clearing after tasting each formulations. They required to taste every formulations of mushroom chips as stated in Table 3.1 and give score into sensory evaluation paper according to nine-point hedonic scale. According to Lim, Wood and Green (2009) nine-point hedonic scale was used to discover level of acceptability. Table 3.2 shows nine-point hedonic scale. 5 criteria that been used in this study are appearance, taste, aroma, crispiness and overall acceptance**.** In this study, *Volvariella volvacea* or also known as paddy straw mushrooms are used. The mushroom was supplied by supplier from UPM, Kajang. The mushroom was brought to food preparation laboratory located at Kulliyah of Allied Health Sciences to undergo cleaning process. This cleaning process is crucial to wash out the impurities and dirt on the surface of the mushroom. After cleaning process, the mushroom is dried in the oven for 10 minutes with temperature 180 degree. Herbs and spices that used in this study are ginger, garlic, holy basil, turmeric, onion and cinnamon that were bought in powder form from local market near Indera Makhota. Then, mushroom is put into food processor together with chickpea flour, paprika, salt, water

as well as herbs and spices according to the formulations. Each dough formulations are rolled with roller until it become thin before shaped into mini square shape. Figure 3.1 , 3.2 and 3.3 show preparing process of mushroom chips. The ingredient in each formulation is shown in the Table 1.0

Table 1 Ingredient in formulations

Ingredients	F1	F2	F3	F4	F5	F6
Mushroom (g)	120	120	120	120	120	120
Cinnamon (g)	5	5	5	5	5	5
Garlic (g)	5	-	5	5	5	5
Onion (g)	5	5	-	5	5	5
Ginger (g)	5	5	5	-	5	5
Holy basil (g)	5	5	5	5	-	5
Tumeric (g)	5	5	5	5	5	-
Paprika (g)	5	5	5	5	5	5
Salt (g)	5	5	5	5	5	5
Water (g)	60	60	60	60	60	60

Statistical analysis

Data from nine-point hedonic rating scale was collected and analysed using Statistical Package for Social Sciences (SPSS) 12.0 version. Analysis of variance (ANOVA) is use to compare mean value for appearance, crispiness, aroma, taste and overall acceptance each formulations while Tukey's post hock test were used to find out which pair of the formulation has significance difference. The difference in the mean was recorded as significant when at 95 percent confidence interval ($P<0.05$).

RESULTS

From the Table 2, the highest mean score for crispiness of the mushroom chips was formulation 3 (6.57). For appearance, the highest mean score is formulation 3 (6.11) and the second highest is formulation with mean score 6.00. Formulation 2 has the highest mean score for aroma (6.20) while formulation 1 has slightly lower mean score (6.17). No formulations reported to have average mean score higher than 6 in the taste of mushroom chips. For overall acceptance, formulation 3 has the highest mean score (6.20) compared to other formulations. According to 9-points hedonic scale, 6 points meaning the panellist like slightly the food product while 5 points meaning the panellist does not like nor dislike the product. Among 5 sensory criteria that were tested in this study, only crispiness has significant ($P<0.05$) difference. In general, all sensory attributes show no difference except for crispiness which significantly different between 6 formulations. The Figure 1 show mean score for crispiness of mushroom chips according to formulations. There was significant ($P<0.05$) difference for

formulation 3 compared to other formulations. It was clear from the score that formulation 3 has the highest acceptability in term of crispiness while formulation 1 has the lowest score indicate that the least acceptance among the panellists. Formulation 1 was significantly difference ($P<0.05$, $P<0.001$) with formulation 2 and 3. The Figure 2 shows the mean score of appearance of mushroom chips according to formulations. There is no significance difference in all formulations for this criterion as the p-value > 0.05. Since all the formulations shows no significance difference, appearance of all formulations are equally acceptable to the panellists. The figure 3 show mean score for aroma of mushroom chips according to formulations. There is no significance difference in all formulations for this criterion as the p-value > 0.05. Since all the formulations shows no significance difference, aroma of all formulations is equally acceptable for the panellist. According to the Figure 4.4, there is no significance difference in all formulations for this criterion as the p-value > 0.05. This shows that the taste of all formulations is not very much difference and was equally acceptable for the panellists. Figure 4.5 show mean score for overall acceptance of mushroom chips according to formulations. There is no significance ($P>0.05$) difference in all formulations for this criteria. This indicate that all formulations are equally acceptable for the panellist. Formulation 3 has the highest acceptability because the mean score is the highest.

Table 2. Comparison mean value of 5 criteria of formulations

Sensory Criteria	Crispiness	Appearance	Aroma	Taste	Overall Acceptance
Formulation 1	3.97(±1.84)	6.00(±1.65)	6.17(±1.72)	5.09(±1.52)	5.31(±1.47)
Formulation 2	4.69(±2.13)	5.51(±1.90)	6.20(±1.39)	5.60(±1.40)	5.83(±1.34)
Formulation 3	6.57(±2.02)	6.11(±1.53)	5.89(±1.51)	5.66(±1.55)	6.20(±1.66)
Formulation 4	5.69(±2.10)	5.23(±1.43)	5.91(±1.38)	5.23(±1.73)	5.43(±1.40)
Formulation 5	5.46(±2.21)	5.97(±1.49)	5.49(±1.54)	4.86(±1.60)	5.31(±1.55)
Formulation 6	5.40(±2.00)	6.03(±1.52)	5.20(±1.75)	5.23(±1.61)	5.46(±1.60)
Total mean	5.30(2.19)	5.81(±1.61)	5.81(±1.58)	5.28(±1.58)	5.59(±1.52)
P- value	0.00	0.129	0.051	5.28	0.091

DISCUSSION

Crispiness of the mushroom chips has significant difference ($P<0.05$) where formulation 3 score the highest. Food product that prepared using microwave result in crispy taste. Study that conducted previously on vacuum microwave drying on fish taste crisp shows that the end product has a smooth texture and crunchy taste (Chi, Zhang & Chen, 2013). Other study does prepare potato chips using microwaving baking result in significant crispiness and bright yellow colour. (Shedeed, Abd El-Hady & ALoweis, 2020). In selection of good chips, crispiness is crucial criteria that will influence acceptance from consumers. According to Chia (2006), perceptions of consumer about high quality chips are the chips has crispy texture as well as nice taste. Most of commercial chips available in markets has high level of crispiness that attract consumer to buy the chips. Crispy texture is expressed as the most acceptable parameter of a food product. It is naturally liked, it improves texture and was a dominant texture criterion associate with high quality cooking (Tunick et al, 2013). Crispiness of the mushroom chips is related to microwaving cooking method in this study because microwaved food has low moisture content hence increase the crispiness of the food product. Since the result shows significance difference, crispiness of formulation 3 are acceptable and can

proceed for further development. In term of appearance, this study shows non-significant difference thus the appearance of the chips is equally acceptable among the panelist. Appearance displays overall impression of the product and they are more practical and communicative that the exterior characteristics (Blijlevens, Creusen & Schoormans, 2009). Appearance is used to be marketing tool of a product because appearance influence consumer's choice (Creusen & Schoormans, 2005) hence it is important to upgrade the appearance to attract consumers. Previous study by Celen (2019) shows that colour enhancement is low when the thickness of the slice of trabzon persimmon is increases thus, to get a brighter, the thickness of the chips need to be reduced. From the ingredients of the mushroom chips in all formulation, holy basil has decent smell that enhance the aroma of the mushroom chips. Xu, Cao, Zhu, Xia and Wang, (2020) highlight that temperature is important to attain food product with better quality and aroma as the temperature differences of the food product can be monitored by the odor law. Study by Heitkamp, Merker and Stungis (1975) mentioned that sufficient heat is required for agent-producing aroma inside the food product to release its aroma to the air space. Since aroma is equally acceptable among the panelist, , more trials need to be done to improve the aroma of the mushroom chips. Taste of flavor in this study indicate that the taste of the mushroom chips is equally acceptable among the panelist. According to Clark (1998), taste and flavour are important factors in consumer food choice. Clark further explained that the taste of food product is an important area of which manufacturers should be aware because if expectations are to be built up around a product and yet not fulfilled, it could cost them dearly. Most of food consumption study demonstrates that high degree of healthiness does not always associate with decent taste but some researchers does not support this statement (Luomala, Jokitalo, Karhu, Hietaranta-Luoma, Hopia & Hietamäki, 2015). Werle, Trendel & Ardito, (2013) emphasized that unhealthy food means bad taste and healthy food means it is tasty in France.

CONCLUSION(S)

From the result, all sensory criteria (appearance, taste, aroma, crispiness and overall acceptance) show non significance difference except for crispiness which significant differently between 6 formulations. Formulation 1 has high mean score in terms of appearance and aroma of the chips but poor in crispiness of the chips. For overall acceptance of the mushroom chips, formulation 3 has the highest acceptability with the highest mean score. It can be concluded that formulation 3 has the highest acceptability. This can be good indication that formulation 3 may be well accepted in food industry.

ACKNOWLEDMENT(S)

The authors would to thanks to all lecturers , staff of Department of Nutrition Sciences, Kulliyah of Allied Health Sciences as well as coursemate and family who had help her and give support. The author would like to thank Mr Zulkafli Daud who is the owner of Mushroom farm in Kajang, Selangor for supplying Paddy Straw Mushrooms that was used in this study.

REFERENCES

Chi, J. Y., Zhang, M., & Chen, F. J. (2013). Study on vacuum microwave drying and preservation of fish taste crisp. Journal of Food Science and Biotechnology, 32(3), 1673-1689

Ulrich-Lai, Y.M., Fulton, S.E., Wilson, M.E., Petrovich, G.D., & Rinaman, L. (2015). Stress exposure, food intake and emotional state. *Stress, 18 4*, 381-99.

Garayo, J., & Moreira, R. (2002). Vacuum frying of potato chips. Journal of Food Engineering, 55(2), 181–191. doi: 10.1016/s0260-8774(02)00062-6

Sujanto, R. (2016). Chips Consumers Mapping-2016 Report Survey (JAKPAT). Retrieved from https://blog.jakpat.net/chips-consumers-mapping-2016-survey-report/

Junk food [Def. 1]. (1952). Merriam-Webster Online. In Merriam-Webster. Retrieved January 2, 2013, from https://www.merriam-webster.com/dictionary/junk%20food

Lawless, H.T., & Heymann, H. (1998). Sensory Evaluation of Food: Principles and Practices.

Shedeed, N. A., Abd El-Hady, E. S. A., & ALoweis, R. A. (2020). Production of Oil-Free Crunchy Potato Chips Using Microwave. Food and Nutrition Sciences, 11(01), 40.

Tunick, M. H., Onwulata, C. I., Thomas, A. E., Phillips, J. G., Mukhopadhyay, S., Sheen, S., ... & Cooke, P. H. (2013). Critical evaluation of crispy and crunchy textures: a review. International Journal of Food Properties, 16(5), 949-963.

Blijlevens, J., Creusen, M. E., & Schoormans, J. P. (2009). How consumers perceive product appearance: The identification of three product appearance attributes. International Journal of design, 3(3), 27-35.

Creusen, M. E., & Schoormans, J. P. (2005). The different roles of product appearance in consumer choice. Journal of product innovation management, 22(1), 63-81.

Çelen, S. (2019). Effect of microwave drying on the drying characteristics, color, microstructure, and thermal properties of trabzon persimmon. Foods, 8(2), 84.

Heitkamp, N. D., Merker, S. L., & Stungis, G. E. (1975). *U.S. Patent No. 3,870,053*. Washington, DC: U.S. Patent and Trademark Office.

Clark, J. E. (1998). Taste and flavour: their importance in food choice and acceptance. Proceedings of the nutrition society, 57(4), 639-643.

Luomala, H., Jokitalo, M., Karhu, H., Hietaranta-Luoma, H. L., Hopia, A., & Hietamäki, S. (2015). Perceived health and taste ambivalence in food consumption. Journal of Consumer Marketing.