Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

AN OVERVIEW - CAN MOLECULAR GASTRONOMY AND GASTROPYHSIC INFLUENCE THE FOOD DESIGN FOR THE ELDERLY IN MALAYSIA?

Farhan Faat*[1]
Rafidah Aida Ramli[2]
Nur'Hidayah Che Amat[3]
Ahmad Fauzan Badiuzaman [4]
Mohd Salehuddin Mohd Zahari [5]

[1] Faculty of Hotel and Tourism Management, Universiti Teknologi MARA Cawangan Pulau Pinang, Kampus Permatang Pauh, 13500 Permatang Pauh, Malaysia
Email: farhanfaat@uitm.edu.my
[2] Faculty of Hotel and Tourism Management, Universiti Teknologi MARA Cawangan Pulau Pinang, Kampus Permatang Pauh, 13500 Permatang Pauh, Malaysia
Email: wanfidah@uitm.edu.my
[3] Faculty of Hotel and Tourism Management, Universiti Teknologi MARA Cawangan Pulau Pinang, Kampus Permatang Pauh, 13500 Permatang Pauh, Malaysia
Email: hidayah.ca@uitm.edu.my
[4] Faculty of Hotel and Tourism Management, Universiti Teknologi MARA Cawangan Pulau Pinang, Kampus Permatang Pauh, 13500 Permatang Pauh, Malaysia
Email: fauzanb@uitm.edu.my
[5] Faculty of Hotel and Tourism Management, Universiti Teknologi MARA Puncak Alam, Selangor, Malaysia
Email: salehuddinm@uitm.edu.my

Article history
Received date : 11-6-2023
Revised date : 12-6-2023
Accepted date : 25-7-2023
Published date : 15-8-2023

To cite this document:
Faat, F., Ramli, R. A., Che Mat, N. H., Badiuzaman,A. F., & Mohd Zahari, M. S. (2023). An overview - can molecular gastronomy and gastropyhsic influence the food design for the elderly in Malaysia?. *Journal of Islamic, Social, Economics and Development (JISED)*, 8 (55), 207 – 215.

Abstract: *The fact that Malaysia is a developing nation with a rapidly aging population is widely acknowledged. Dysphagia, or trouble swallowing and digesting, is becoming more common as the population ages. It is important to emphasize that people who have dysphagia need nutrient-rich foods with the right texture to help with intake and to provide the necessary nutrients. As technology advances and becomes more sophisticated in practically every aspect, gastronomy in food and cooking is not left behind in assisting the elderly. The development of molecular gastronomy and gastropyhsic knowledge may be able to improve the nutritional and feeding quality of life for elderly individuals. Due to the dearth of knowledge on molecular gastronomy and gastrophysics in Malaysia, this study able to add to the body of knowledge and provide useful information. Therefore, this research will be conducted as an exploratory study, and since insight is needed, a mixed method will be used, leading to the creation of an inspired product. This study will be carried out to investigate the impact of hedonic qualities and acceptance of inspired food products on the elderly. Perhaps the food development with current knowledge of molecular gastronomy and gastrophysics could benefit in developing a splendid dish and will be accepted by the elderly.*

Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

Keywords: *Molecular Gastronomy, Gastropyhsic, Elderly, Malaysia, Product Development*.

Introduction

The term 'Elderly' refers to people aged 60 and above, and this demographic is the world's fastest increasing. In 2019, there were 703 million older people worldwide, with the proportion of senior citizens increasing significantly in most countries (World Health Oganization, 2020). In the context Malaysian environment, it is commonly recognised that Malaysia is a developing country that is rapidly approaching an ageing populace. According to current figures from the Department of statistic Malaysia (DOSM, 2022), there are 32.7 million people of multicultural diversity and ethnicity living in 14 states. The population aged zero to 14 years (young age) fell to 23.2%, down from 23.6% in 2021. The population aged 15 to 60 years increased from 69.4 percent in 2021 to 69.5 percent in 2022. Malaysia's population is predicted to age, and the elderly are commonly related with trouble eating behaviours.

Dysphagia, or difficulty swallowing and digesting, becomes increasingly common as the population ages. According to Smith-Hammond et al. (2004), variety of physiological changes that impair chewing and swallowing ability can contribute to varying degrees of dysphagia, impaired sensory perception, and saliva production. Distress during meals is one of the symptoms of dysphagia, which can lead to reduced or changed food intake and weight loss. It is vital to highlight that individuals with dysphagia require nutrient-rich foods that have the correct texture to assist intake while also providing the required nutrients. Along with the above ideas and facts, an early intervention or planning is required to ensure the elderly can enjoy eating and maintain health despite oral and sensory impairment.

As technology advances and becomes more sophisticated in practically every aspect, gastronomy in food and cooking is not left behind in assisting the elderly. It is commonly recognised that food science has recently advanced considerably, perhaps with molecular gastronomy knowledge and the emergence of gastropyhsic able to aid enhance elderly people's quality of life in terms of nutrition and feeding. At the very least, capable of replenishing physiological requirements and providing adequate sustenance for daily demands. According to Barham et al. (2010) the goal of most researchers in food is to improve people's quality of life. According to the aforementioned notion, with the advancement of technology, particularly in food development and preparation, molecular gastronomy is not totally to deliver surprise components to the end user. It can also redesign food to make it more appealing, worthy, and beneficial. For instance, to preserve the health and nutrition of the elderly, it is vital to develop and provide foods that are easy to chew, swallow, and supplement with vitamins and minerals. Perhaps, encourage the creation of a wide range of texture-modified products that fortify vitamin C and minerals such as calcium or iron into the daily diets of the elderly, particularly those suffering from age-related diseases.

According to Caporaso (2021), molecular gastronomy is a set of techniques and culinary arts used to make wonderful food, and it is widely used in a broad sense. With enhancing gastropyhsic in food design can elicit emotion and chemical sensations, potentially aiding in the improvement of quality of life in terms of nutritious intake. As a result, gastronomy is seen as a source of inspiration, resulting in the establishment of a scientific subject with many foci, such as neurogastronomy, gastrophysics, and molecular gastronomy. Particularly when it comes to reducing the impact of oral impairment and reduced sensitivity in the elderly. Perchance this scientific application in food will improve the elderly's food sensory and

Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

appetite. Eventually increase their food intake and become a pivotal factor in reducing malnutrition and several sicknesses related to ageing among the elderly, such as dysphagia. Perhaps a food development with current knowledge of molecular gastronomy and gastrophysics could benefit in developing a splendid dish that the elderly will accept.

Literature Review

Gastronomy terminology has been widely used in the culinary world for about three decades, and various fields related to it have been actively explored since then. According to Santich (2007) in Faat and Zainal (2016), the term gastronomy comprises a multidisciplinary understanding of many social, cultural, and historical components, literature, philosophy, economic religion, cuisine, technology, and others, with food as the ceentral axis. Indeed, researchers from all over the world have created enormous opportunities for those in need through their research. In the case of modern cuisine, more research demonstrates that the use of science in cooking has improved the quality of life. As for this study, it will focus on science in food, therefore it entails on molecular gastronomy, gastropyhsic and elderly

Molecular Gastronomy

The word gastronomy indicates a set of techniques and culinary arts to prepare good food, and it is commonly intended in a broad sense as the study of the relationship between culture and food (Caporasa, 2021). Within the scientific community, a new discipline known as molecular gastronomy has emerged. As mentioned by This (2006), molecular gastronomy can be defined as the chemistry and physics in the process during the preparation of one dish. It is a new term to describe the connection of two food discipline which was food science and the art of science (McGee, 2004) and the collaboration between food scientist and innovative chef (Barham et al, 2010). Notably, the molecular movement was pioneered by Herve This and Kurti in 1988 and talented chefs such as Heston Blumenthal, Ferran Adria, Pierre Gagniare, and Grant Achatz were among the first generation and prominent chefs to collaborate with scientists and apply molecular gastronomy elements in their cooking (Faat and Zainal, 2013; Selahi et al, 2022).

Gastropyhsic

Gastronomy has served as a source of inspiration for the establishment of scientific fields with various foci. These fields within natural sciences include gastropyhsics, molecular gastronomy, and neurogastronomy (Pedersen et al, 2021). According to Spence (2017), gastrophysics changes the emphasis from the "science of the kitchen" to the "science of the (mind of the) diner". Barham et al (2010) also reviewed the field and highlights that it relates to both the chemical and physical state of the food and to the sensory perception of food and integration in the brain. Thus, gastropyhsic can be defined as the study of gastronomy and cooking through the application of physical and chemical principles, with a special focus on the consumer's perception of foods, in the field of "neurogastronomy" (Spence, 2017). On the same note, according to Mouritsen (2016), gastrophysics is the scientific discipline concerned with understanding the fundamental mechanics and behaviour of culinary phenomena such as the physics of food preparation and consumption. Therefore, both chefs and sensory scientists focus on perception and food appreciation, emphasising the necessity of researching how people perceive foods and why people love certain cuisines. It is fully understood that, gastrophysics seeks to comprehend the physics of gastronomy (the art and understanding of making and consuming a nice meal) and cooking (the practical skills associated with meal preparation). Specifically, to observe phenomena of gastronomic significance, investigate them thoroughly, and comprehend why they occur. Indeed, there is a close but complex connection between, (1) Aspects of eating that affect the whole sensory experience, such as taste, fragrance, mouthfeel,

Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

and astringency. (2) The food's chemical and physical composition and (3) The transformation, perception, and absorption of food in the mouth and body. Gastrophysics seeks to comprehend this link. That is, how the sensory experience is related to the physical and chemical features of the meal as well as the cooking techniques used (Mouritsen 2016).

The Application of Molecular Gastronomy and Gastropyhsic In Food Design

At the beginning of molecular gastronomy, This (2013) stated that he and Kurti want to use what has been applied in scientific disciplines such as chemistry, physics, and biology to modernise culinary practices. However, in 1969, Kurti only mentioned the use of physical techniques, whereas in early 1980, they began to use chemical substances. He also noted that novel tools, ingredients, and processes are the definitions of molecular gastronomy. Furthermore, they believed that laboratory equipment could be used and applied in the kitchen as well. For example, siphoned in generating foams, circulator machine for lower temperature cooking, and liquid nitrogen in making ice cream. Some of the ingredients are not novel and are commonly used in chemistry laboratories, but the goal is to modernise the cuisine. As mentioned by Caporaso and Formisano (2016) most of the ingredients not commonly used in the kitchen but are frequently applied in the food industry, e. g., sodium alginate, calcium lactate, phenols extracted from grape juice, flavors, ascorbic acid, etc., are also used in molecular cooking. This situation has led to the term of molecular cuisine. As stated by Caporaso (2021) the application of molecular gastronomy principles in the restaurant kitchen or home cooking can be called ‘molecular cooking’, which is the application of science in the kitchen.

Along with the above notion, example of molecular gastronomy techniques like Spherification (a round pearl of gel with a liquid centre is created by mixing a base with sodium alginate and dropping it into a calcium lactate bath) or reverse spherification (a round pearl of gel with a liquid centre is created by dropping a mixture of base with calcium lactate into a sodium alginate bath). With the contact of the calcium ions, the gelation process occurs, resulting in the formation of a very thin gel membrane around the liquid mixture (Faat and Zainal, 2013). Then there's the use of maltodextrin as a component in turning oil into powder. "Powder oil" coats the lips pleasantly while releasing the oil's powerful flavour (Yek and Strawe, 2008; Faat and Zainal, 2013). Faat and Zainal (2013) mentioned another technique in molecular movement, gelatinization, in their article. Gelatine and pectin, have been frequently utilised in Western culinary domains for decades. Gelatine, like aspic, makes nice gels, although it begins to melt at 35 degrees Celsius (Cassi, 2011; Faat and Zainal, 2013). Thus, after Ferran Adria discovered a common ingredient from the Far East known as agar (melt at 85 degrees Celsius) in western molecular. It has altered the value and perception of Westerners. Meanwhile, liquid nitrogen with a temperature of -196 Celsius has been used for a variety of industrial purposes. Because of the quick-freezing procedure, this approach can reduce product crystallisation (Ivanovic et al 2011; Faat and Zainal, 2013; Selahi et al, 2022). In any case, there was a clear link between the goals of molecular gastronomy as a scientific field and the development of new recipes employing new ingredients and technologies, analogous to the relationship between food science and food engineering. Spain was without a doubt a leader in the field of molecular gastronomy thanks to the chefs and the use of additives such as sodium alginate, gellan gum, and glycerol monostearate, among others (García-Segovia et al, 2014). Ferran Adria, the 'Salvador Dali of the kitchen' in Spain, is a pioneer chef who popularised the concept by initiating the largest gastronomic revolution of the century. He used the syphon (a piece of machinery meant to manufacture whipped cream by using carbon dioxide 'CO2' and nitric oxide 'NO2') to create mousses and foam using uncommon components such as vegetables, fruits,

Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

fish, and meat (Adria et al, 2010; Cassi, 2011; Faat and Zainal, 2013). It is well noted that, molecular gastronomy can help in improving the definition of sensory attributes of dishes (Wansink et al., 2005). As previously stated, new methods and tools, such as sous-vide, ultrasonic probes, rotary evaporators, distillators, or liquid nitrogen, are frequently used; researchers and chefs stressed the importance of developing new sensory approaches to investigate the topic of consumer appeal towards food, or "measuring the deliciousness." (Caporaso, 2021).

Meanwhile in gastropyhsic, as noted by Gluchowski et al (2021) completed an assessment of hedonic in laboratory conditions feel that if a test of hedonic behaviour at specific atmosphere may provide alternative perspective. The multimodal environment in which people eat and drink, and how ambient sensory signals may affect consumers (Spence et al, 2014; Spence, 2017), and buildings (Edwards et al, 2003). To date, much gastrophysics research has focused on 'the everything else', which influences multisensory food experiences, rather than the relationships between food components and perception. This encompasses the role of plateware, glasses, cutlery, multisensory atmospheres, brand touch points, food aesthetics, and a variety of other elements (Spence, 2017). All of these elicited pleasure and arousal in human behaviour and provided a new experience for the consumer. However, as Moller (2013) contends, flavour "is not all in the brain." This situation has now prompted some of the world's foremost molecular gastronomy chefs, such as Heston Blumenthal, whose most famous restaurant is the three-Michelin-starred The Fat Duck, to include a sonic element in some of the gastronomic experiences that they provide to their customers. Consider 'The Sound of the Sea,' Blumenthal's iconic fish dish on the tasting menu at his flagship Bray restaurant for many years. The entrée, which resembles the beach, with sand, froth, seaweed, and, if lucky, seafood, arrives at the table with a conch shell from which emerges a pair of iPod headphones. The server will respectfully recommend that to put on the headphones before tasting the cuisine, where consumer will hear the sounds of the seaside (Spence, 2020). This dish arose from research conducted in Oxford, coincidentally, began demonstrating that oysters are rated as tasting better when consumer hear such a soundtrack than when hear the sound of farmyard chickens, clinking cutlery, or even the modern jazz that seems to be preferred as the sonic background by a few too many of our top restaurants (Crisinel et al, 2011). Furthermore, a number of studies have now demonstrated how the freshness and crispness of dry food products such as potato chips (or crisps), biscuits, and pretzels can be dramatically changed simply by changing the self-generated sounds that a person hears when they bite into such a foodstuff (Zampini and Spence, 2004). Visual signals have a major influence on both the flavour of the food consume and the strength of the tastes (Spence et al 2010). 'Eye appeal is half the food,' as they say. While visual cues may not be part of many people's definition of flavour, chefs frequently use colour and texture to play with their diners' sensory expectations. Changing the appearance of something is probably one of the most common ways to create surprise in a dish (Spence et al, 2010). For example, hunger and satiety influence hedonic perception. Interoceptive states influence flavour appreciation, and food choices are influenced by culture as well as education. Gastrophysics could thus be regarded of as including the study of everything from internal states to cultural influences on eating experiences. (Laudan, 2013)

The goal of gastrophysics is to figure out how everything is linked with one another between the sensory experience and the food's physical and chemical features, as well as the methods used in cooking (Mouritsen, 2016). Ice cream, for example, is a soft-textured meal that is typically seen as rich and luxurious due to its creamy texture, which offers a smooth and velvety experience in the mouth. Furthermore, the advancement of gastrophysics will not only provide

Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

food experts and home cooks with a better understanding of how to prepare 'better meals,' but it will also be an important addition to the existing scientific approach to food, which is driven by commercial and industrial considerations. Since the scope of gastrophysics is broad, at least for this study, research will be conducted to delve the emergence of gastrophysics in gastronomy, specifically towards inspired food development design and specifically in basic human senses like taste (flavour), smell (aroma), touch (texture), hearing (sound), and sight (vision) in evaluating food and only partially other multi-sensory will take place. Inspired by this new approach to food experience, food design is one area of inquiry that has broad potential applications in the design of more enticing experiences that are more effective in reducing consumer mind, and can inspire better strategies for food innovation aiming to put forward novel ingredients and food processes. Gastrophysics plays an important role in improving the provision of flavorful and nutritious food options to the growing elderly population (Spence and Youssef 2021), particularly when it comes to understanding how physical properties of food, such as texture, affect its perceived taste and overall acceptability to the consumer, including people who have difficulty swallowing or chewing.

Methodology

Because this is an exploratory study and insight is required, a mixed method will be used. It all starts with obtaining basic data by examining literature, defining the topic and developing objectives, designing the study, and developing instruments. This stage results in the establishment of objectives and study design. The next step is to collect data from focus groups to gain an in-depth understanding of the sensory and behavioral needs of the elderly. Then, to establish an inspired product, a product development and sensory is required. Following that, a food testing and descriptive study will be carried out to assess the acceptability and perception of the inspired product. Acceptance of the elderly could be measured using a hedonic test. According to Kahkonen (2000), food approval is tested through affective and sensory tests with potential customers. Acceptance, in particular, refers to an individual experience, a sensation or emotion having a hedonic character (Cardello 1996). Overall, sensory consumer research is useful in product design to assure product acceptance. The distinction is that the emphasis in food and nutrition studies is more on the effect of varied and distinct elements connected to food acceptance (Schutz, 1999). Finally, all information from the interview and descriptive sessions will be triangulated to find data that is corroborated, and weaknesses in the data can be compensated for by the strength of other data, increasing the validity and reliability of the results.

Conclusion

It is worth noting that the perception of food products or their choices and preferences in the elderly is influenced by a complex interplay of physiologic, psychological, social, and hereditary factors. Their recollections, history, and previous sensory experiences can all have an impact (Boesveldt et al., 2018). Consumption of some items may result in a more effective response because it is associated with happy emotions and memories, such as childhood, family or friends, celebrations, and cooked meals (Laureati et al., 2006). According to Pedersen et al. (2021), gastrophysics has the potential to make sustainable food more appealing and widely accepted by linking the fundamental mechanisms of culinary phenomena to design and practice. Therefore, this research will be focused on the potential applications of molecular gastronomy techniques and gastropyhsic knowledge in the development of tasty, nutrient-dense diets for the elderly that are easy to chew and swallow. At the same time to investigate the impact of hedonic qualities and acceptance of inspired food products on the elderly.

Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

Perhaps the food development with current knowledge of molecular gastronomy and gastrophysics could benefit in developing a splendid dish and accepted by the elderly. Despite the social responsibilities and problems faced, as well as the laws put in place by the government, there is still much that needs to be done to address the issues confronting Malaysia's ageing society. To prevent elderly malnutrition in this country, continued efforts are needed to develop a stronger and more sustainable healthcare delivery system. On the same vein, the food industry must continue its research into developing materials suitable for easily prepared dishes for the elderly, while keeping in mind that food taste and appearance are just as vital as nutrition and safety. Due to the scarcity of information on molecular gastronomy and gastrophysics in Malaysia, this study may be able to give information and add to the body of knowledge. According to Velasco (2021), the discipline of gastrophysic is still relatively new, and it is necessary to integrate food design with other disciplinary studies such as experimental psychology, cognitive neuroscience, design, marketing, economics, ethnography, and culinary arts. As a result, the primary explanation for the highlighting issue necessitates more examination.

Acknowledgments
Thank you to Universiti Teknologi Mara, Cawangan Pulau Pinang provides the facility for me to conduct my PhD study.

References

Adrià, F., Soler, J., & Adrià, A. (2008). A day at elBulli: an insight into the ideas, methods, and creativity of Ferran Adrià. *(No Title)*.

Barham, P., Skibsted, L. H., Bredie, W. L., Bom Frøst, M., Møller, P., Risbo, J., ... & Mortensen, L. M. (2010). Molecular gastronomy: a new emerging scientific discipline. *Chemical Reviews*, *110*(4), 2313-2365.

Boesveldt, S., Bobowski, N., McCrickerd, K., Maître, I., Sulmont-Rossé, C., & Forde, C. G. (2018). The changing role of the senses in food choice and food intake across the lifespan. *Food Quality and Preference*, *68*, 80-89.

Caporaso, N. (2021). The impact of molecular gastronomy within the food science community. In *Gastronomy and Food Science* (pp. 1-18). Academic Press.

Caporaso, N., & Formisano, D. (2016). Developments, applications, and trends of molecular gastronomy among food scientists and innovative chefs. *Food Reviews International*, *32*(4), 417-435.

Cardello, A. V. (1996). The role of the human senses in food acceptance. *Food choice, acceptance and consumption*, 1-82.

Cassi, D. (2011). Science and cooking: the era of molecular cuisine. *EMBO reports*, *12*(3), 191-196.

Crisinel, A. S., Cosser, S., King, S., Jones, R., Petrie, J., & Spence, C. (2012). A bittersweet symphony: Systematically modulating the taste of food by changing the sonic properties of the soundtrack playing in the background. *Food quality and preference*, *24*(1), 201-204.

Department of Statistic Malaysia. (2022, July 29).*Current Population Estimates, Malaysia 2022.* Ministry of Economy. https://www.dosm.gov.my/portal-main/release-content/current-population-estimates-malaysia-2022

Edwards, J. S., Meiselman, H. L., Edwards, A., & Lesher, L. (2003). The influence of eating location on the acceptability of identically prepared foods. *Food Quality and Preference*, *14*(8), 647-652.

Faat, F., & Zainal, A. (2013). Molecular gastronomy movement and application in food. *Hospitality and tourism: Synergizing creativity and innovation in research*, 391-394.

Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

Faat, F., & Zainal, A. (2016). The Influence of Hedonic Characteristics on Chefs' Acceptance Towards Molecular Asam Pedas. In *Regional Conference on Science, Technology and Social Sciences (RCSTSS 2014) Business and Social Sciences* (pp. 1085-1094). Springer Singapore.

García-Segovia, P., Garrido, M. D., Vercet, A., Arboleya, J. C., Fiszman, S., Martínez-Monzo, J., ... & Ruiz, J. (2014). Molecular gastronomy in Spain. *Journal of Culinary Science & Technology*, *12*(4), 279-293.

Głuchowski, A., Czarniecka-Skubina, E., Kostyra, E., Wasiak-Zys, G., & Bylinka, K. (2021). Sensory features, liking and emotions of consumers towards classical, molecular and note by note foods. *Foods*, *10*(1), 133.

Ivanovic, S., Mikinac, K., & Perman, L. (2011). Molecular gastronomy in function of scientific implementation in practice. *UTMS Journal of Economics*, *2*(2), 139-150.

Kähkönen, P. (2000). Consumer Acceptance of Reduced-fat Foods: The Effects of Product Information.

Laudan R. (2013). *Cuisine and empire: Cooking in world history* (Vol. 43). Univ of, California Press.

Laureati, M., Pagliarini, E., Calcinoni, O., & Bidoglio, M. (2006). Sensory acceptability of traditional food preparations by elderly people. *Food quality and preference*, *17*(1-2), 43-52.

McGee, H. (2004). *McGee on Food & Cooking: An encyclopedia of kitchen science, history and culture*. Hodder & Stoughton.

Møller, P. (2013). Gastrophysics in the brain and body. *Flavour*, *2*, 1-4.

Mouritsen, O. G. (2016). Gastrophysics of the oral cavity. *Current Pharmaceutical Design*, *22*(15), 2195-2203.

Pedersen, M. T., Hansen, P. L., & Clausen, M. P. (2021). Gastronomy unravelled by physics: Gastrophysics. *International Journal of Food Design*, *6*(2), 153-180.

Santich, B. (2007). The Study of Gastronomy: A Catalyst for Cultural Understanding. *International Journal of the Humanities*, *5*(6).

Schutz, H. G. (1999). Consumer data—sense and nonsense. *Food Quality and preference*, *10*(4-5), 245-251.

Selahi, N. S., Ramli, R. A., Tan, Z. A., & Faat, F. (2022). Gastronomy: An Overview of Molecular Gastronomy Awareness. *Insight Journal*.

Smith-Hammond, C. A., New, K. C., Pietrobon, R., Curtis, D. J., Scharver, C. H., & Turner, D. A. (2004). Prospective analysis of incidence and risk factors of dysphagia in spine surgery patients: comparison of anterior cervical, posterior cervical, and lumbar procedures. *Spine*, *29*(13), 1441-1446.

Spence, C. (2017). *Gastrophysics: The new science of eating*. Penguin UK

Spence, C. (2020). Gastrophysics: Nudging consumers toward eating more leafy (salad) greens. *Food Quality and Preference*, *80*, 103800.

Spence, C., & Youssef, J. (2021). Aging and the (chemical) senses: implications for food behaviour amongst elderly consumers. *Foods*, *10*(1), 168.

Spence, C., Levitan, C. A., Shankar, M. U., & Zampini, M. (2010). Does food color influence taste and flavor perception in humans?. *Chemosensory perception*, *3*, 68-84.

Spence, C., Puccinelli, N. M., Grewal, D., & Roggeveen, A. L. (2014). Store atmospherics: A multisensory perspective. *Psychology & Marketing*, *31*(7), 472-488.

This, H. (2006). Molecular gastronomy. In *Molecular Gastronomy*. Columbia University Press.

This, H. (2013). Molecular gastronomy is a scientific discipline, and note by note cuisine is the next culinary trend. *Flavour*, *2*, 1-8.

Volume: 8 Issues: 55 Special Issue [August, 2023] pp. 207 - 215
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.jised.com
DOI: 10.55573/JISED.085520

Velasco, C., Michel, C., & Spence, C. (2021). Gastrophysics: Current approaches and future directions. *International Journal of Food Design*, *6*(2), 137-152.

Wansink, B., Van Ittersum, K., & Painter, J. E. (2005). How descriptive food names bias sensory perceptions in restaurants. *Food quality and preference*, *16*(5), 393-400.

World Health Organization. (2020). Ageing.

Yek, G. S., & STRAWE, K. (2008). Deconstructing molecular gastronomy. *Food technology (Chicago)*, *62*(6).

Zampini, M., & Spence, C. (2004). The role of auditory cues in modulating the perceived crispness and staleness of potato chips. *Journal of sensory studies*, *19*(5), 347-363.