

CHAPTER II

LITERATURE REVIEW

2.1 Ingredients Review

2.1.1 Oyster Mushroom

There are currently over 2000 edible types of fungi called mushrooms that are found all over the world. The most commonly grown varieties are button (*Agaricus bisporus*), shiitake (*Lentinula edodes*), and oyster (*Pleurotus* spp.) mushrooms. One of the most widely farmed mushroom species worldwide, oyster mushrooms (*Pleurotus* spp.) are in high demand and have a variety of advantageous qualities (such as pharmacological capabilities). Therefore, it would be beneficial to evaluate and debate the various cultivation and valorisation methods, as well as the variables influencing oyster mushroom development and yield, in the mushroom cultivation sector. (Wan Adibah Wan Mahari *et al.*, 2020). *Pleurotus* mushrooms are rich in several nutritional compounds like dietary fibers, proteins, carbohydrates, essential amino acids, water-soluble vitamins, and minerals as well as many functional bioactive molecules including polyphenols, polysaccharides, lipids, and terpenoids. (Gréta Töröset *et al.*, 2022).

Oyster mushrooms have an exceptional ability to harness umami, the savory fifth taste, in culinary creations. With a rich and powerful umami profile, these mushrooms are a go-to choice for creating vegetarian nugget analogues. When incorporated into the recipe, oyster mushrooms give off a deep, meaty flavor that closely mimics traditional nuggets. Their natural umami goodness enhances the overall taste, making sure satisfying and flavorful eating experience for vegetarians and meat-eaters alike. Oyster mushrooms have successfully proven that they can be a key ingredient in creating delicious, plant-based nuggets that increase the

competition of their meat counterparts, offering a savory and nutritious alternative that caters to diverse dietary preferences.

2.1.2 Enoki Mushroom

The renowned enoki mushroom is well known for its culinary, nutritional, and therapeutic benefits. Enoki cultivation has increased quickly in China and Japan in recent years due to its popularity. Extracted from both mycelium and fruiting bodies, bioactive substances such flammulinolide, enokipodin, proflamin, and other polysaccharides have shown potential for treating hypertension, hypercholesterolemia, and tumors. (Ved P. Sharma *et al* 2021). Enoki mushrooms are well known for their anti-inflammatory, cholesterol-lowering, and immune-boosting properties. Enoki mushrooms include mycosterol and dietary fiber that can hasten the breakdown of cholesterol. decreases liver, low-density lipoprotein in the serum, triacylglycerol, total cholesterol, and these substances. A potential source of Se supplementation and biotransformation is the enoki mushroom. Selenium has positive impacts on the detoxification processes and free radical defense of cells. Enoki mushrooms can thereby balance the body's tolerance and decrease selenite. The polysaccharides in the Enoki mushroom boost macrophage growth and phagocytic activity while reducing the production of free radicals in the body. Therefore, consuming Enoki mushrooms—especially the cap—contains antioxidants with cancer-preventive effects. (Waill Ahmed Elkhateeb *et al* ., 2022).

Enoki mushrooms have gained it's reputation for their unique flavor profile and versatility in culinary applications. In a recent review, these delicate mushrooms received praise for their ability to impart a subtle umami richness to dishes. Their umami-packed quality makes them an excellent choice for creating vegetarian nugget analogues. When enoki mushrooms are incorporated into the recipe, they bring an earthy, savory note that elevates the overall taste and texture of the nuggets. This umami

infusion not only satisfies the palate but also adds depth and complexity to the dish, making it a first choice among those seeking meat alternatives. Enoki mushrooms, with their permanent umami goodness, contribute to the creation of delicious and nutritious vegetarian nuggets, proving once again that plant-based options can be just as satisfying as their meat counterparts.

2.1.3 Eggplant

Eggplant (*Solanum melongena* L.) is a nonwoody annual plant that reaches a maximum height of 120 cm and has purple to white flowers, big lobed leaves, and bushy foliage. Most eggplants are farmed for vegetables and health reasons. Aspartic acid, tropane, flavonoids, lanosterol, gramisterol, steroid alkaloids, glycoalkaloids, histidine, nasunin, oxalic acid, solasodine, ascorbic acid, and tryptophan are just a few of the essential compounds that the phytochemical analysis of eggplant reveals are abundant in the fruits and leaves. Additionally, it has a high moisture content and few calories. These substances were discovered to be beneficial in the treatment of a number of illnesses, including cancer, anti-inflammatory, anti-asthmatic, anti-platelet hypolipidemic, and hypotensive, among others. The most cutting-edge scientific methods are now accessible to treat a wide range of health issues, however the majority of the population all across the world rely on conventional herbal remedies and practices. This evaluation emphasizes the nutritional value, therapeutic properties, and health advantages.(Muhammad Yasir Naeem *et al.* ,2019).

Pivoting the umami potential from eggplants to produce umami-incorporated vegetarian nugget analogs has become a popular approach. This method focuses on mainly the umami richness present in eggplants, effectively transforming them into a pivotal ingredient for creating delicious vegetarian nugget alternatives. Channelling the umami essence found in eggplants to create umami-packed vegetarian nugget analogs

has gained significant footing. This strategy hits into the natural savory depth that eggplants offer, resulting in the development of flavorful and satisfying meatless nugget substitutes.

2.1.4 Tofu

Tofu, a popular food made from soybeans, is a good source of protein, vitamins (A, C, D, E, K), minerals (calcium, phosphorus, potassium, magnesium, iron, zinc, manganese, selenium, and copper), and B vitamins (such as riboflavin, thiamine, niacin, pantothenic acid, biotin, vitamin B-6, vitamin B-12, and folate). Tofu is a versatile plant-based protein with a host of nutritional benefits. It's rich in essential amino acids, making it an excellent source of protein for vegetarians and vegans. Additionally, tofu is low in saturated fats and contains no cholesterol, making it heart-healthy. It's also a good source of iron, calcium, and magnesium, essential minerals for bone health. Tofu's ability to harness umami, the savory taste sensation, is particularly noteworthy. When used as a core ingredient in vegetarian nuggets, tofu can create a savory, meaty flavor profile that mimics traditional nuggets, making them satisfying and delicious for both vegetarians and meat-eaters alike. This umami-rich quality of tofu not only enhances the taste but also provides a nutrient-dense alternative to conventional nuggets, contributing to a healthier and more sustainable diet.

Tofu also contains a lot of omega-3 fatty acids, which are essential for healthy health. The necessary amino acids for a healthy, balanced diet are also provided by tofu. One 122-gram block of hard tofu has 177 calories, 5.36 grams of carbohydrate, 12.19 grams of fat, 15.57 grams of protein, 421 milligrams of calcium, 282 milligrams of phosphorus, 178 milligrams of potassium, and 65 milligrams of sodium, 27 micrograms (mcg) of folate, 3.35 milligrams of iron, 2 milligrams of zinc, and 2 milligrams of magnesium. Niacin, riboflavin, thiamin, vitamin B-6, choline, manganese, and selenium are also present in trace amounts. For

males and women, the recommended daily protein intake is 56 grams and 46 grams, respectively. We require around 0.80 grams of high-quality protein per kg of body weight every day. Tofu delivers enough protein per serving to meet more than 18% of our daily needs. Moreover, just one serving of tofu provides 33% of the daily need for iron. (Mahendra Pal *et al.*,2019).

2.2 Product Review

Regular chicken nuggets and vegan nuggets made from enoki mushroom, oyster mushroom, tofu, and eggplant showcase notable differences in terms of ingredients, flavour, and dietary preferences. Regular chicken nuggets, typically made from chicken meat, have a familiar taste and texture that many people enjoy. They offer a savoury and juicy experience, with a crispy outer coating that adds an element of crunch. On the other hand, vegan nuggets made from enoki mushroom, oyster mushroom, tofu, and eggplant provide a unique and plant-based alternative. These vegan nuggets offer a range of flavours and textures. The enoki mushrooms contribute a delicate and earthy taste, while oyster mushrooms provide a meaty and chewy texture. Tofu adds creaminess and a boost of plant-based protein, while eggplant brings a slightly sweet and savoury element. Additionally, the vegan nuggets are suitable for individuals following a vegan or vegetarian lifestyle, accommodating dietary preferences and offering a cruelty-free option. Whether you prefer the traditional taste of chicken nuggets or are looking for a plant-based alternative, both options provide delicious choices that cater to different tastes and dietary needs.

2.3 Process Review

2.3.1 Steaming

Two typical moist heating techniques for preparing meat include steaming and boiling. Cooking time and cook values have been discovered to be significantly influenced by steam in particular. Steam transfers energy to the meat sample more quickly than water does because it does so at a higher rate for the same medium velocity. The

amount of time the meat needs to cook overall may be shortened by this rapid heat transfer. Using steam to cook provides a lot of benefits. As a result, cooking periods might be shortened, which is beneficial for energy conservation and preserving the quality of the meat.(Yu Song *et al* ., 2021). This process is to make the nugget firmer so we can shape it easily and cut it.

2.3.2 Freezing

The preservation process known as freezing preservation involves first using cooling equipment to cool the aquatic products' centers, freezing the majority of the water inside, and then freezing the aquatic products at a temperature of 18 °C or below. Different factors have varying degrees of impact on the quality of aquatic products. The most popular freezing techniques include liquid nitrogen flash freezing, air freezing, flat freezing, tunnel continuous freezing, and dipping freezing. It was discovered that the freezing method and freezing pace have an impact on the quality of fish products when frozen. The size and regularity of ice crystals are influenced by the freezing rate. The structure of the food is not significantly harmed by the fine, homogeneous, and extracellular ice crystals produced by rapid freezing. Though slowly, Large and irregular extracellular ice crystals created by freezing cause the breakdown of muscle tissue and lower the sensory appeal of meals. (Ying Lvet *al* .,2021). But the freezing is really needed to make the shelf life of this product even longer and well preserved.

2.3.3 Frying

During traditional frying, oil is used as a heating medium at temperatures in a 160–180 °C range or higher . The original structure of fried meals changes significantly after being exposed to hot oil. By frying in the 170-180 °C range, these vegetarian nuggets are frequently created with a crispy exterior from the breadcrumbs and wonderful taste. The act of frying involves numerous simultaneous events. The first is cooking, which causes a number of heat-induced chemical processes, including

the gelatinization of starches, denaturation of proteins, and the Maillard and caramelization reactions. The breakdown of the starch granule's molecular structure, which results in particle expansion and decreased solubility, is known as starch gelatinization. In order to prevent oil absorption and build a crust on the top of fried dishes, it is crucial. Dehydration comes in second, and the oil since the temperature is consistently kept well over 100 °C, the water in the frying goods is quickly removed in the form of steam. Additionally, during the frying process, the products' structure and texture alter, and their lipid content increases. Due to the oil's absorption and nutrient modification, frying results in foods with a high calorie content. Unhealthy trans fatty acids are also known to be produced during frying (Xiaotian Zhang *et al.*,2020). This step is very crucial to develop the crust of this nugget so it can make the skin crispy and golden brown.