Review On Innovative Flours to Increase The Nutritional Value And Organoleptic Acceptabi;ity of Food, Especially Cakes, Slices of Bread and Pizza

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Abstract

Most cakes, breads, and other snacks are made from wheat flour. Using wheat flour as processed food is not suitable for health because wheat flour contains gluten. With the growing awareness of the importance of health, there have recently been many studies on innovative flour substitutes for wheat flour in food processing, which are rich in beneficial bioactive components. This innovative flour is used in particular types of bread and pizza. This study aims to study the effect of innovative flour on the physical, texture, taste, and nutritional properties of bread and pizza dough. In addition, this research can also describe steps to optimize dough formulations with innovative flours to achieve healthier, low-gluten dough. The method used in writing this scientific work results from a Systematic Literature Review (SLR) from published scientific journals, national and international journals. From the literature obtained, it was found that innovative potato-based flour, peel, and grape seed-based innovative flour, innovative flour from avocado seeds, special flour from the leaves and stems of various colored cauliflower varieties, and a mixture of kamut and wheat flour added with glucomannan were innovations in consumption flour-based food.

Keywords*: innovative flour, nutrition, dough*

Abstrak

Kebanyakan kue, roti, dan makanan ringan lainnya terbuat dari tepung terigu. Penggunaan tepung terigu sebagai makanan olahan tidak baik bagi kesehatan karena tepung terigu mengandung gluten. Dengan semakin meningkatnya kesadaran akan pentingnya kesehatan, akhir-akhir ini banyak penelitian tentang inovasi tepung pengganti tepung terigu dalam pengolahan makanan, yang kaya akan komponen bioaktif yang bermanfaat. Tepung inovatif ini digunakan pada jenis roti dan pizza tertentu.Penelitian ini bertujuan untuk mempelajari pengaruh tepung inovatif terhadap fisik, tekstur, rasa, dan sifat gizi adonan roti dan pizza. Selain itu, penelitian ini juga dapat memaparkan langkah-langkah mengoptimalkan formulasi adonan dengan tepung inovatif untuk menghasilkan adonan yang lebih sehat dan rendah gluten. Metode yang digunakan dalam penulisan karya ilmiah ini merupakan hasil dari Systematic Literature Review (SLR) dari jurnal ilmiah yang diterbitkan, jurnal nasional dan internasional. Dari literatur yang diperoleh ditemukan inovasi tepung terigu berbahan dasar kentang, tepung inovatif berbahan dasar kulit kentang, dan biji anggur, tepung inovatif berbahan dasar biji alpukat, tepung inovatif berbahan dasar daun dan batang kembang kol aneka warna, serta campuran kamut dan Tepung terigu yang ditambah glukomanan merupakan inovasi konsumsi pangan berbahan dasar tepung.

Kata kunci*: tepung inovatif, nutisi, adonan*

1. Introduction

Using wheat flour as processed food is not suitable for health because wheat flour contains gluten. Some people can develop gluten intolerance when consumed in specific amounts. As a result, the absorption of nutrients is disrupted due to changes in the small intestine and then causes damage to the human body, starting with impaired absorption of nutrients (Massytah et al., 2019). In addition, it has been explained that the gluten in wheat flour can cause various diseases, such as indigestion, diarrhea, flatulence, weight loss, fatigue, and anemia. (Wijayanti et al., 2015).

With the increasing awareness of health for the public, especially consumers of processed food products, the nutritional and food aspects are a priority in consuming processed food products. This has increased demand for healthy food with consumer health benefits. This makes developing innovative products with high nutritional value even more important. The creative use of flour, when obtained from the by-products of the agricultural industry, can provide the necessary nutrients for developing this type of food, increasing its nutritional value (Difonzo et al., 2023). Therefore, researchers want to minimize

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by-product waste such as skin/skin, fiber, fruit skin, and pomace from raw agro-food (fruit/vegetable) processing materials. They use these by-products to produce value-added food, feed, fiber, protein, carbohydrates, organic acids, biopolymers, oils, and so on (Ventorino et al., 2016); (Sohany et al., 2021).

Flour is standard in many products and recipes worldwide, especially for bread dough, pizza, and other pastries. The development of innovation in the wheat flour industry has resulted in many new types of flour with unique properties and benefits. One type of flour innovation is alternative flour. One of his most significant accomplishments is the discovery of alternative flours made from non-traditional ingredients. Examples are potato skin flour, potato flour, avocado seed flour mixed with wheat flour and added glucomannan, jackfruit seed flour, lute flour, and grape seed. This flour is suitable for people with gluten intolerance or those following a specific diet.

Some products from innovative alternative flours include sponge cakes, cookies, chips, sticks, pizza, and others. Pizza is a food originating from Italy which is made from flour that is kneaded into pizza dough as the basis of the pizza itself by fermentation and then covered with pasta sauce and given a topping, along with cheddar cheese, mozzarella, and a sprinkling of oregano and then through the baking process. Unlike the case in bread making, it is hoped that the bread dough will expand and produce a soft texture; in the pizza-making process, the dough is expected to be slightly dense/not too fluffy and thick.

In this article, several types of innovative flour alternatives will be described above which; at all stages of the production of the food industry, large amounts of waste and by-products are generated daily, which present major environmental problems(Difonzo et al., 2023). This article will also explain the processing process for each innovative alternative flour and the benefits or advantages of these innovative alternative flour. With simple technology and simple pretreatment, the quality of innovative flour can be improved by reducing anti-nutritional substances and browning which occurs both enzymatically and non-enzymatically. Pretreatment to eliminate/ minimize negative results and the best treatment as the main research line for the innovative flour produced.

2. METHODOLOGY

2.1 Materials and tools

Reading materials consist of scientific journals, national and international journals that have been published and are reputable.

2.2. Research design

The research method used is descriptive quantitative based on Systematic Literature Review (SLR). The SLR method is systematic, transparent, aband le to provide a theoretical basis for the identification, evaluation, and synthesis of the primary studies, which are the sub t is the article's subjects(Okoli & Schabram, 2010)

2.3 Research Stages

This research is conducted in 2 stages, namely the PRISMA method with the following stages:

1. Search for related articles on the googlescholar.com page using a combination of the keywords "innovative flour," "seed flour," "flour substitution," "peel flour," and "combined flour" in 2010-2023, combined with the keywords "fiber-rich flour " "gluten intolerant" "composite" "flour" "Blanching" "antioxidants" "roasting" and "drying" time range 2000-2023.
2. Then articles are selected based on title and abstract and are fully accessible**.** The results of the article search were 50 articles which were then used in making results and discussion. The process of searching for articles is presented in Figure 1.

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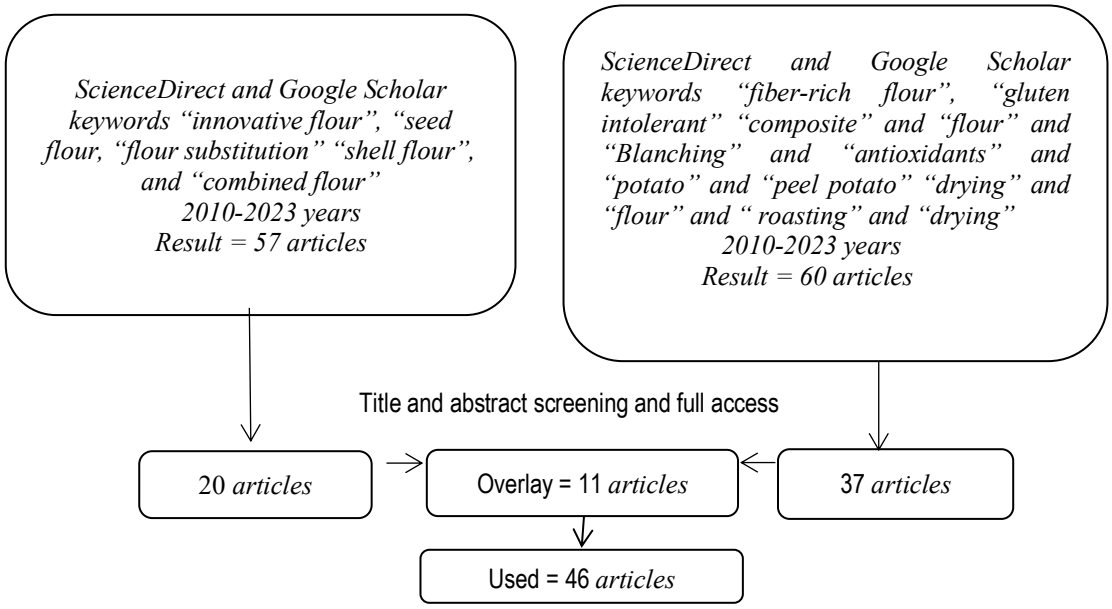

Figure 1. Article Search Process

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3. RESULTS AND DISCUSSION

Based on the literature studies that have been conducted, it is known that several innovative alternative flours can replace the use of wheat flour either as a whole or by way of substitution or with a combination of nutrients. Total replacement or substitution and this flour combination can be applied in manufacturing traditional cakes, cookies, bread, brownies, and pizza. The various kinds of innovative alternative flour include:

3. 1 Potato Peel flour (*Solanum tuberosum*).

A large amount of potato peel is released into the food industry as a by-product of potato processing (Wu, 2016). The waste of potato skins is a significant amount from potato processing ranging from 15 to not more than 40% of the original mass of the product. This has become an attraction for the food industry to be processed again into other ingredients such as potato peel flour (Gebrechristos & Chen, 2018); (Akyol et al., 2016). Potato peels, a by-product of the food industry, are a cheap, valuable, and affordable raw material for producing economically essential substances. Potato peel has various uses, including value-added and product extraction, dietary fiber, biopolymer, natural antioxidants, and raw food additives (Chiellini et al., 2004).

Potato peel flour is a flour that can be developed as a source of potassium. Potato peel flour was prepared in several stages, namely peeling the potatoes, soaking them in a 0.3% sodium bisulfite (NaHSO3) solution for 60, 90, and 120 minutes, drying, mashing, and filtering. Potato peel flour with various soaking times had moisture content (7.84 - 9.03%), ash content (4.15 - 4.67%), protein (11.35 - 11.60%), fat (0 .74 - 0.87%), carbohydrates (74.63-75.26%) and potassium (1231.32-1671.86 mg/100) (Ratnayani, 2021).

In the manufacture of potato peel flour, the color of the flour obtained is brownish (browning). This can occur in fruits and vegetables, especially potatoes, caused by the enzymatic oxidation of certain phenolic compounds (mono-, di- and polyphenols) to o-diphenols. In addition, quinones are formed, which cause non-enzymatic polymerization and the formation of melanin or brown pigments. For this

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reason, immersion was carried out in 0.3% sodium bisulfite (NaHSO3) solution for 60, 90, and minutes, and the resulting potato peel flour was followed.

Figure 2. Potato Peel flour by soaking
(NaHSO3) 0.3% for 60, 90, and 120 minutes (Ratnayani, 2021)

From these functional properties, potato skin flour is very suitable for use as a composite cake formulation by producing cakes that have better physical and organoleptic qualities.

3.2 Potato flour (Dioscorea bulbifera L.)

Indonesia has various kinds of tubers. Most of these tubers have yet to be fully exploited optimally by the community, one of which is the air potato, often called the gambol tuber (Dioscorea bulbifera L.), which until recently was considered an inferior tuber (low quality) (Agustin et al., 2019). Generally, consuming air potatoes in society only involves boiling or steaming them. Air potatoes are tubers similar to yam tubers with a larger size. Both are included in the genus Dioscorea which contains relatively high content (± 25%) (Palupi et al., 2018)

The suitable alternative for processing air potatoes is to process them into flour, turning them into flour for a longer shelf life. Constraints in processing air potatoes as tubers will experience a browning process caused by the reaction of the phenolase enzyme with oxygen in the air (Windaryati et al., 2013). For this reason, air potatoes that will be processed into flour are first given pretreatment, one of which is blanching, which aims to inactivate enzymes that cause changes in the quality of food ingredients. This potato flour is used as a raw material for making wet cakes, cookies, bread, and pizza.

The steps for making air potato flour consist of sorting the air yam, peeling the air yam skin, and cleaning and washing it to remove any dirt that still sticks. The potatoes are then boiled at 90°C. The length of blanching time used is 12 minutes. After blanching, the airy potatoes are cut into pieces or sliced with a thickness of ± 0.5 cm. Sliced air potatoes weighing up to 300 g were then dried in an oven at room temperature for 18 hours at 60°C. Then chop with a blender finely grind until an airy potato starch is formed, then sift. Use an 80-mesh sieve for fine, air potato starch (Agustin et al., 2019). Physicochemical properties of air potato flour as a result of this study were moisture content 7.03-7.47%, ash content 3.60-4.39%, wettability 22-235 seconds, Kamba density 0.54-0.71 g/mL, water absorption 6.41-6.96 g/g. The yield of this air potato starch is 11.91-19.56%.

3.3 Avocado seed flour (Persea americana Mill)

The avocado seed represents 13-18% of the avocado fruit and is rich in various functional and bioactive components, namely polysaccharides, proteins, lipids, minerals, and vitamins. Avocado seeds contain many bioactive substances, namely phenols, flavonoids, and condensed tannins (Tesfay et al., 2012); (Melgar et al., 2018); (Tremocoldi et al., 2018) , whereas (Rahmawati et al., 2020) stated that the avocado fruit contains 70% flesh and 30% avocado seed. Avocado seeds are rich in nutrients such as carbohydrates, proteins, lipids, and ash (Justina Y et al., 2016); they also contain lignocellulosic, which consists of cellulose (16.36%), hemicellulose (34.15%) and lignin (15.25%) (Diana et al., 2018). , and

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also contains phytochemicals such as phenolics, tannins, and flavonoids which have antioxidant activity (Ge et al., 2017), (Feliana et al., 2018) and (Rivai et al., 2019).

Processing avocado seeds into avocado seed flour is an alternative to processing waste into products rich in nutrients and bioactive compounds with health benefits and longer shelf life. Brownish discoloration, bitter taste, and nutrients must also be considered when processing avocado seeds into processed products (Novitasari, 2020). For this reason, several pre-treatment treatments are for processing avocado seeds into avocado seed flour (TBA).

The steps for making TBA are as follows: the avocado seeds are sorted, peeled, blanched for 3 minutes, put in cold water to stop the ripening process, and immediately roasted at 120^{o}C for 15 minutes and then reduced in size. They were boiled with NaCl solution, immersion in sodium metabisulfite,e solution, and through a blanching process, soaked in cold water, then dried in an oven at 60^{o}C for 24 hours. Finally, size remade is done by grinding, blending, and sifting with an 80-mesh sieve to produce TBA. Based on chemical analysis of avocado seed flour, it is known that the seeds are high in carbohydrates (49.03 ± 0.02 g/100 g), fat (17.90 ± 0.14 g/100 g), protein (15.55 ± 0.36 g/100 g) and water content (15.10±0.14 g/100 g). It is also known that the seeds contain low ash content (2.26 ± 0.23 g/100 g) and total oxalate (14.98 ± 0.03 mg/100 g). Tannin levels (6.98 ± 0.04 mg/100 g) and phytic acid (3.18 ± 0.16 mg/100 g) are also present in low amounts (Ejiofor et al., 2018); (Windaryati et al., 2013).

3.4 Flour from a mixture of kamut and wheat flour plus glucomannan

Corte, D. et al (2020) investigated a low glycemic index (LGI) Neapolitan Pizza formula by identifying the right mix of those ingredients for LGI pizza, preventing digestive disorders, and helping people with diabetes eat pizza without the severest of serious damage to their glucose control while enjoying an active social life.

This study compares flour used as a raw material for making pizza. Here compared thecompare3 pieces of flour;

1. WWF is a milled product based on common wheat (Triticum aestivum). It contains large amounts of bran and may be progressive. Refined to Class 2, 1, 0, 00F flour. 00F, as required by law and WWF, is configured like this ,
   - 00F:
     13.9% moisture, 8% protein, 1% fat, 84.7% carbohydrates (mainly starch), 1% dietary fiber, 0.4% minerals Salts (magnesium, potassium, iron, copper, zinc)
   - WWF:
     13.9-14.5% moisture, 12-13% protein, 9-10% fat, Carbs 79.5e80% Fiber 2e2.5% Mineral Salts 1.5e2% (magnesium, potassium, iron, copper, zinc)(Carnovale & Miuccio, 2013) dan (Clark & Slavin, 2013).
2. KF comes from Khorasan (Triticum turgidum ssp. Turanicum). Wheat flour commercialized by Kamut is called. Khorasan is an ancient grain with larger, more nutritious properties Beans are more efficient than soft wheat (higher protein content, content of vitamins and mineral salts)—lots of gluten (40% higher protein content than WWF) and lower blood sugar. The index (i.e., 45 vs. 85 of 00F) makes Kamut suitable for fabrics and the development of Furnace Products that Simultaneously Realize the Hypoglycemic Action Effect (Carnovale & Miuccio, 2013); (Clark & Slavin, 2013); (Benedetti et al., 2012) dan (Cicero et al., 2018).
3. GM is extracted from the Amorphophallus konjac tuber used in Japanese cuisine as a thickening agent (Cicero et al., 2018); (Au-Yeung et al., 2018); (Chearskul et al., 2009). By attracting high amounts of water, its purified form generates a soft gelatinous mass 60 to 100 times larger than the original volume, which provides efficient weight loss when added to a low-calorie diet.

The best and highest score for MF fabric was achieved in test 3. (See Table 1):All 4 Pasta Masters received the highest score(i.e. 25), I agree 100%. Therefore, we chose this combination (i.e.70

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± 2 g kF, 30 ± 2 g WWF, and 10 ± 0.5 g glucomannan for Pizza 3.)Henceforth, we refer to this as "created".such a mixture.

Table 1. Description of the four different pizza component proportions (Kamut, WWF, and glucomannan) selected to determine the optimal blend in the presence of stable water, salt, and brewer's yeast amounts.

	TEST n.1	TEST n. 2	TEST n. 3	TEST n. 4
KF (g)	72 ±2	70±2	70±2	68± 2
WWF (g)	33 ±2	33 ±2	30±2	30±2
GLUCOMANNAN (g)	5 ± 0.5	8 ± 0.5	10 ± 0.5	12 ± 0.5
SALT (g)	2 ± 0.2	2 ± 0.2	2 ± 0.2	2 ± 0.2
BREWER'S YEAST (g)	0.2 ± 0.05	0.2 ± 0.05	0.2 ± 0.05	0.2 ± 0.05
WATER (ml)	87.8 ± 1	87.8 ± 1	87.8 ± 1	87.8 ± 1

from State Monopolies
(Corte, D. et al., 2020).

The mean score for the taste/digestibility section. The survey results summarized in Table 2 demonstrate this. Pizzas 1 and 3 can overlap and work Better than Pizza 2, as shown in Table 3. Poor palatability, and a high incidence of gastrointestinal side effects, Present in about 50% of tasters (see Questionnaire 2/iii).

Table 2. Scores were obtained at the liking/digestibility-related section of the questionnaire (means ± SD).

	Question 1	Question 2	Question 3
Pizza 1	4.9 + 0.1	2.1 + 0.5	1.5 + 0.3
Pizza 2	2.6 + 0.6**	4.2 + 0.3**	3.8 + 0.4**
Pizza 3	4.7 + 0.3	2.0 + 0.3	1.4 + 0.3

**p < 0.01 vs. pizza 1 and 3.

Table 3. Rating of tasters for the three pizzas (%). GI stays for "gastrointestinal."

	PIZZA 1	PIZZA 2	PIZZA 3
Pizza Rating (liked)	85%	50%**	80%
Low Digestibility	15%	60% **	15%
GI Side Effects	5%	40% **	5%

**p < 0.01 vs. Pizza 1 and Pizza 3 (Corte, D. et al., 2020).

The data shows that LGI Pizza certain combinations of KF, GM, and WWF (i) Are postprandial hyperglycemia spikes in the whole pizza Wheat flour, (ii) enjoyed and appreciated as much as TP, and

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(iii) Do not cause digestive problems the results of this study describe the underlying validation process selection of final blend details to achieve the result. The whole process is transparent and accessible for anyone ready to reap the benefits of this special LGI pizza. It is used as a thickening agent in dishes or sauces and as a mixture in making pancakes, crepes, bread, cakes, or fried dough.

Pizza has become a typical food all over the world Consumption is becoming more widespread as diabetes prevalence increases and low glycemic index pizza is available. It tastes just as good as the traditional version, but it's highly desirable to reduce itPost-ingestion hyperglycemic spikes, as demonstrated in previous articles.

3.5 Jackfruit seed powder (Artocarpus heterophyllus)

Researchers worldwide have widely studied jackfruit seeds as a substitute for starch. Jackfruit is a potential starch source because it is commonly cultivated in Asia, especially in Southeast Asian countries. Jackfruit seeds are considered a cheap source of carbohydrates because the seeds contain a lot of 60-80% dry matter or around 8-15% of the weight of the fruit. The roots of the fruit are consumed and cooked by baking, boiling, frying, or even steaming. In recent years, the food industry has tended to process food and beverages by utilizing by-products/waste from fruits and vegetables, for example, seeds, one of which is jackfruit seeds (Suzihaque et al., 2022) ; (Zhang et al., 2021).

Jackfruit seeds need to be more utilized and more well-known to the general public, even though jackfruit seeds still have critical nutritional benefits and can be considered a potential functional food ingredient. Recently, many studies have been conducted on jackfruit seeds' composition and health benefits. However, it is necessary to find more information about the excellent production of jackfruit seeds and their use in food. Products with jackfruit seed flour have better nutritional attractiveness and higher consumer acceptance (Waghmare et al., 2019). Jackfruit seeds have considerable nutritional benefits and constitute about 10% to 15% of the fruit weight of the total fruit weight (30-365/fruit) and have high carbohydrate and protein content (Hossain, 2014); (Ocloo et al., 2010)..

After the jackfruit seeds were washed and the outer brown layer was removed, the roots were sliced and pretreated by blanching with 0.5% potassium metabisulfite for 10 minutes. The jackfruit seeds were dried using a cabinet dehydration technique at 60 0C for 24 hours; then, the dried slices were ground into jackfruit seed powder.

The water content of jackfruit seed flour is 6.09%. Ash and fat content (dry matter) was 2.70% and 1.27%, respectively. Protein, fiber, and carbohydrate content were 13.50%, 3.19%, and 79.34%, respectively. The caloric value obtained is 382.79 kcal/100g. Jackfruit seed flour contains high levels of calcium (3087 mg/kg), iron (130.74 mg/kg), potassium (14781 mg/kg), sodium (60.66 mg/kg), copper (10.45 mg /kg), and manganese. (1.12 mg/kg)[37]. The rheological properties of jackfruit seed flour are described as follows. High water absorption capacity (25 %), fat absorption capacity (17.0 %), and specific gravity (0.80 g/cm3) were recorded for jackfruit seed flour. The swelling power, foam capacity, and foam stability values were 4.77, 25.34 %, and 33 %, respectively (Ocloo et al., 2010). Thus jackfruit seed flour can be used as a thickener and binder in food systems.

3.6 Seed and Grape Peel Flour

A large number of by-products are produced during the production of wine Equivalent to 30% w/w of raw material grapes, Grape skins (consisting mainly of grape skins and seeds) are most often (Bordiga, Travaglia, et al., 2019); (Bordiga et al., 2015) dan (Muhlack et al., 2018). Because of its properties, processed grape skins have recently been proposed as a food ingredient. This is because of the content nutritional value and its abundant functional components, such as the content of dietary fiber, phenols, flavonoids, and other antioxidants (Beres et al., 2016); (Bordiga, Montella, et al., 2019); and (Mattos et al., 2017). Grape seeds, on the other hand, account for 2-5% of the whole grape weight and 40-50% of the solid waste in the wine industry (Bordiga, Travaglia, et al., 2019); (Libera et al., 2020). In terms of nutrition, from one point of view, this by-product is valuable for the presence of

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antioxidants—Compounds, tocopherols, vitamin E, fiber, and protein (Barba et al., 2016); (Troilo et al., 2022).

This research aimed to develop a pizza base utilizing oenological flour's technical and functional properties. Fortified pizza bases were obtained by replacing wheat flour with 15, 20, and 25% skin flour (GS) and skin/seed flour (GM). Substitution with GS and GM increased the content of anthocyanins and phenolic compounds and antioxidant activity, mainly when grape skin and seed mixtures were used. Adding the highest proportions of GS and GM gives us a "high fiber" pizza base that achieves more than 6 g fiber per 100 g (Difonzo et al., 2023).

4. CONCLUTION

Using wheat flour as processed food is not suitable for health because wheat flour contains gluten. Some people may develop gluten intolerance when gluten is consumed in a certain amount. This causes an increase in demand for healthy food which positively impacts consumers' health. This resulted in many studies to produce innovative products with high nutritional value, especially from agricultural waste. Innovative alternative flour creation; potato peel flour, potato starch, avocado seed flour, a mixture of kamut and wheat flour plus glucomannan, jackfruit seed flour, seed meal, and peel grape.

Knowledgeable, the stages of making innovative flour from tubers and grains consist of sorting the ingredients, peeling the skin, cleaning, and washing to remove any dirt that is still attached. Next, the boiling/blanching process is carried out. After that, the ingredients are cut into pieces and then dried in the oven or roasted for a few minutes. The dried tuber or seed slices are then finely blended until flour is formed and then sifted through an 80-mesh flour sieve..

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