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A Nutritious and Tasty Fast Food - Vegetable Fortified Noodles

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Abstract:

Enhancing the nutritional value of instant noodles can be achieved by fortifying either the flour used in their production or the flavors accompanying the noodles. Instant noodles, comprising precooked and dried noodles combined with powdered spices or oil, form the basis of this quick meal. Fortified instant noodles often contain increased levels of iron, folic acid, and vitamin B-12. However, most noodles are high in fat, carbohydrates, salt, and calories while lacking in fiber, protein, and antioxidants, categorizing them as junk food. Tomatoes are a primary source of lycopene, an antioxidant associated with various health benefits, such as reducing the risk of heart disease and cancer. They also contain significant amounts of vitamin C, potassium, folate, and vitamin K. Carrots are rich in beta-carotene, fiber, vitamin K1, potassium, and antioxidants. They are a nutritious snack aiding in weight loss, contributing to lower cholesterol, improved eye health, and potentially reducing the risk of cancer due to the antioxidants in carotene. Spinach is abundant in vitamin A, vitamin C, vitamin K, iron, folate, and potassium, offering substantial fiber content as well. Capsicum boasts high water and fiber content and is low in fat. Additionally, it is rich in lutein and zeaxanthin, both shielding the retina from oxidative damage. While instant noodles have gained popularity as a type of junk food, they remain low in essential nutrients, lacking significant health benefits. Despite this, instant noodles are widely favored by people of all ages. In response to this demand, we have developed noodles, whole wheat flour infused with tomato puree, carrot paste, spinach puree, and capsicum

paste to provide a unique natural vegetable flavor. Opting for wholemeal flour over patent flour was deliberate due to its higher fiber, mineral, and vitamin content.

Keywords: Noodles, Fortification, Vegetables, Nutrition Composition

1 Introduction:

Vegetables are essential for balanced diets since they provide a significant supply of nutraceuticals for use in everyday life. Nearly 200 countries grow vegetables, which are a significant component of the human diet in many regions of the world. Even though the medical and nutrition sectors have long understood the value of vegetables in terms of nutrition, the general people are becoming more aware of the benefits of eating a lot of vegetables for their health [1]. Among those vegetables tomatoes are the most popular nutritional source of vitamin c, lycopene, which has been linked to a variety of health advantages, including a lower risk of heart disease and cancer. Many research investigations have demonstrated the superior antioxidant, anti-inflammatory, and anticancer properties of the tomato and the products generated from it [2]. Vitamins (vitamins A and C, thiamin, riboflavin, niacin, pantothenic acid, and pyridoxine), minerals (calcium [Ca], magnesium [Mg], phosphorus [P], potassium [K], sodium [Na], zinc [Zn], manganese [Mn], and others), and moisture (95%), carbohydrate(3%), protein (1.2%) make up an interesting portion of tomatoes' nutritional composition [3]**.** One of the top ten vegetable crops worldwide is the carrot. They have a significant impact on human nutrition because of their high nutritional value and excellent preservation qualities [4][5][6]**.** Carrot are a great source of beta- carotenes, which have been linked to cancer prevention, vitamin A, potassium and pectin, which helps to low the cholesterol level. They also contain vitamin C, B6, thiamine, folic acid and magnesium. Fresh carrots are vulnerable to microbial deterioration due to their high moisture content, even when stored in a controlled environment and refrigerator [7].

The qualities of capsicum make it ideal for use as food [8]. Numerous phytochemicals, including vitamins, phenolics, and flavonoids, which are significant antioxidants and may prevent degenerative diseases, are found in peppers. In instance, vitamin B5 and the majority of the B vitamins, including vitamins C, A, and E, are abundant in peppers. Additionally, they contain significant amounts of calcium, phosphorus, magnesium, and potassium [9][10]. Unsaturated fatty acids, folate, iron, potassium, and antioxidants are all found in abundance in the dark green leafy vegetable spinach [11]. Lutein and zeaxanthin, two carotenoid molecules found in high concentrations in spinach, are protective against eye disorders. More research revealed that chemicals and extracts from spinach may slow or stop the age-related decline in brain function [12]. By reducing the damaging effects of oxidation on the brain, spinach shields brain function from early ageing and slows down old age's typical detrimental impacts on mental capacities. Proteins, lipids, carbs, iron, and vitamins A, B, and C are among the chemical elements of spinach (Amaranthus spp.) that are good to health [13]

Noodles were invented in China as early as 5000 BCE. The consumption of noodles is rising globally and is a favourite cuisine in many Asian nations, including Bangladesh, India, China, Japan, and Thailand [14]. One of the most popular types of snacks is instant noodles. In essence, noodles are one kind of ready to cook food that is commonly created from wheat flour. Noodles are one of nutritious and practical dishes that are loved by people of all

ages all over the world [15]. Because they are simple to prepare and have a long shelf life, noodles have one of the highest consumption rates in Asian nations. Noodle consumption has expanded globally due to their convenience, palatability, and shelf life, affordability and consistency [16]. There is an increasing global trend towards the production of food goods as people continue to seek more nutritious, long-lasting, and visually appealing foods [17][18]. Among the flours for making noodles, whole wheat flour has more fiber, minerals and vitamins. Therefore whole wheat flour is generally thought to be healthier. While they are a rich source of carbohydrates, quick noodles typically lack proteins. Despite its rising popularity, on-going consumer expectations for a healthier lifestyle have compelled food scientists and commercial producers to go beyond the limitations of traditional pasta production by looking into new and unique components. Even though instant noodles have a lot of flavour, they are not necessarily healthy. This is a result of the nutritional content being insufficient and the presence of particular substances used in food additives [19]. More vegetables must be included throughout the manufacturing process to produce noodles that are largely nutritiously balanced and healthy, especially for a time when the body is growing and developing. It is anticipated that noodles will become a food product high in vitamins with the addition of vegetables [13]. Unfortunately, a lot of people dislike vegetables as a dietary supplement, especially kids and teenagers [20]. As a result, it is important to work to process foods that are suitable for children and high in vegetables [13]. However, with customer approval and manufacturer business inclination, enriched veggies have an opportunity to improve nutritional qualities. This study's objective was to assess the nutritional value and sensory acceptability of various combinations of vegetable extract on created noodles [14].

2 Methodology:

2.1 Raw material:

Whole wheat flour, salt, powered sugar, oil, and fresh vegetables like tomato, carrot, capsicum, spinach was collected from local market.

2.2 Preparation of vegetable extract:

Fresh vegetables like tomato, carrot, capsicum and spinach leaves purchased from the local market were washed with tape water. For preparing tomato and capsicum extract, first cleaned tomatoes and capsicums should be cut into small pieces. Then have to be boiled separately at 70-90℃ for 3-5minutes. After heating they are pulping and straining of pulp and the collect the extract of tomato and capsicum separately. For preparing the carrot extract, firstly the cleaned carrots are peeled and washed and cut in to small pieces. The carrot pieces should be blanched in boiling water for 5minutes. Then the carrot pastes are extracted from the boiled carrots using a mixer grinder. For making spinach extract firstly the clean spinach leaves are cut into small pieces maximum 3cm length and then they are grind through mixture grinder and make the juice.

2.3 Preparation of atta noodles and fortified noodles:

To preparing the simple atta noodles, whole wheat flour, salt, sugar, refined oil and water are used to make dough. To prepare fortified noodles the dough is made by using whole wheat flour mixed with tomato juice, carrot paste,

capsicum juice and spinach juice separately. Also another dough is made by using all of these like tomato, carrot, capsicum and spinach juice with whole wheat flours to preparing mixed fortified noodles. Each dough was covered with plastic and left resting for 10minutes. Small balls of dough was cut and put in hand extruder and with pressure rotate the handle of hand extruder and thin long cylindrical shaped products are coming out. After that the noodles are placed into tray dried for 3-4hours at 105℃. After drying the dried noodles are cooled and packed in a zip lock pouch which is shown in Fig 1.

Fig 1: Dried noodles fortified with different vegetables.

2.4 Sensory analysis:

Based on sensory attributes, each customer has a different preference for noodles. A 9-point hedonic scale is the industry standard for sensory analysis, and it measures the general approval of values for the sensory score ranged from 2.7 to 7.02 [21]. The nine-point hedonic scale was used to evaluate the appearance, colour, texture, flavour, taste, mouth feel, and overall acceptability of the experimental dried noodles by the panel of judges. (9 = liked very extremely, 8 = liked very much, 7 = liked moderately, 6 = liked slightly, 5 = neither liked nor disliked, 4 = disliked slightly, 3 = disliked moderately, 2 = disliked very much, and 1 = disliked extremely) [14].

2.5 Determination of cooking quality:

Cooking quality was determined by cooking time, cooking loss and swelling index. Noodle volume gain, water absorption, and cooking loss were assessed using the AACC techniques 66–50 [22]. In order to find the ideal cooking time, cooked noodles were crushed between two glass plates until the white hard core in each strand of noodles vanished [12]. The cooking water grows muddy and dense, and the noodles grow weaker and less sticky. Usually, the term "cooking loss" is used to scientifically quantify this. The percentage of dry matter lost during cooking to dry weight was used to calculate cooking loss [11]. Water absorption is a measure of how much water is absorbed under specific parameters, such as the type of plastic, the additives used, the temperature, and the duration of exposure [14].

2.6 Proximate nutritive analysis of raw material and noodles:

The proximate composition of moisture and ash for samples of noodles and raw materials and sedimentation value of flours were determined using standard procedure. The sample and raw material's moisture content were assessed using the standard AOAC method. The ash content of noodles and raw materials was determined using muffle furnace and the samples are heated at 550℃ for 5hours. Placed 4gm of flour and 50ml of distilled water in 100ml measuring cylinder for determined the sedimentation value of flour. After mixing solution it allows slurry to stand for 5minuties. Add 2-3drops methylene blue or bromophenol blue indicator and 25ml of lactic acid or isopropyl alcohol solution in cylinder. Immediately after mixing, place the cylinder in an upright position and start timing with a chronometer for 10- 12minuties. At the end 5minuties read the volume of sediment in cylinder and this volume is sedimentation value of flour.

2.7 Total phenolic content:

By using Folin- ciocalteu regent the total phenolic content was determined [23]. the absorbance was measured at 750nm and the result was expressed.

3 Results and discussion:

3.1 Proximate nutritive analysis of raw materials and noodles:

Moisture content of raw materials was significantly high compared with fortified noodles**.** Low moisture content generally increases the shelf life of food products. A large reduction in humidity was accompanied by a small increase in due to the use of protein in place of flour extract from vegetables [11]. Nutritive value of raw materials is presented in Table 1 and fortified noodles are presented in Table 2. The result of sedimentation value of whole wheat flour is 28ml.

3.2 Total phenolic content:

Total phenolic content of mixed fortified noodles is 55.8(µg/ml) followed by the calculation TPC as GAE,$A = (C \times V) \div m$.

Table 1. Proximate Analysis values of raw materials

Analysis		**Sample**			
	Basis	**1**	**2**	**3**	**4**
Moisture (%)	Dry	14.47	1330.4	836.53	1298.4
	Wet	12.64	93.1	89.32	94.4
Ash (%)	Wet	0.72	1.35	1.86	0.87

Here sample 1: whole wheat flour, sample 2: tomato, sample 3: carrot, sample 4: capsicum

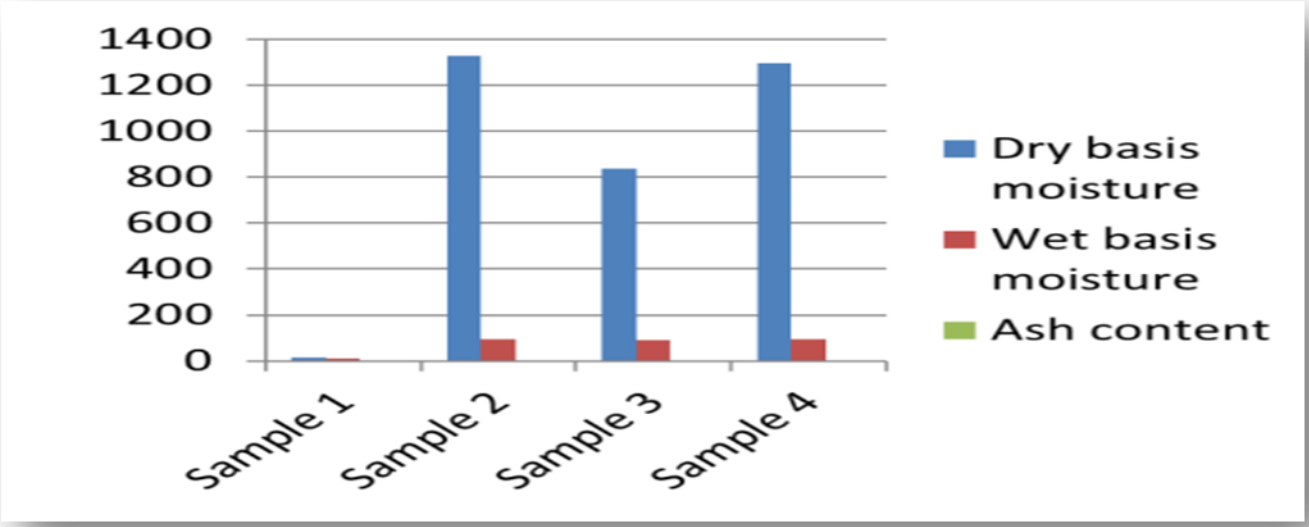
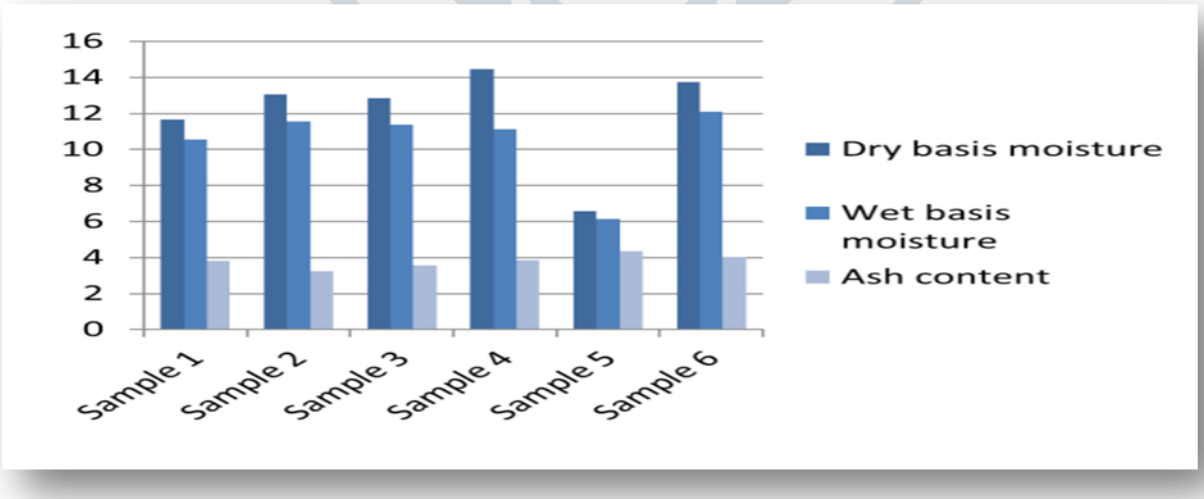


Table 2. Proximate Analysis values of formulated noodles

Analysis		Sample					
	Basis	**1**	**2**	**3**	**4**	**5**	**6**
Moisture (%)	Dry	11.67	13.05	12.85	12.44	6.56	13.74
	Wet	10.45	11.55	11.36	11.14	6.15	12.08
Ash (%)	Wet	3.8	3.25	3.55	3.83	4.35	4.01

Here sample 1: flour based noodles, sample 2: Tomato fortified noodles, sample 3: carrot fortified noodles, sample 4: capsicum fortified noodles, sample 5: spinach fortified noodles, sample 6: mixed fortified noodles.



3.3 Effect of the fortifying vegetables on instant noodles:

Foods that have been enriched with dietary fibre have better functional qualities overall, however there may be issues with the food's technical quality [24]. As a result, the fortified noodle's cooking performance is displayed in

Table 4 in terms of the ideal cooking time, cooking loss. Both visual inspection and image analysis can be used to determine the quantity of cooking. In this study, it was established by the removal of the strand's central core during cooking. All of the noodle samples had cooking times that were best between 6 to 4 minutes. There are no discernible changes in cooking loss between all fortified noodles expect mixed fortified noodles. It directly represents the material loss of the dry noodles during cooking and is a regularly used indicator of noodle cooking quality.

3.4 Sensory evaluation:

The sensory evaluation of fortifying noodles is depicted in Table 3 which was judged by six panel judges. The colour of spinach fortifying noodles was highly significant by the panellists. Flavour, mouth feel and taste of tomato and carrot fortifying noodles were highly acceptable by others noodles. There was no significant difference in colour of mixed and capsicum fortifying noodles. Mouth feel and taste of flour based noodles was very creamy. Overall acceptability of mixed fortifying noodles was high compared with others fortifying noodles.

Table 3: Sensory evaluation of different types of fortified noodles

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Colour	5.2	6.0	8.5	7.7	8.5	5.3
Texture	6.3	7.3	7.0	8.2	7.4	6.4
Flavour	5.8	8.2	8.4	7.3	8.1	6.8
Mouth feel	7.2	8.2	8.3	7.7	7.6	7.0
Taste	6.4	7.5	8.5	6.0	6.8	7.6
Overall acceptance	6.5	8.2	7.9	6.8	6.7	8..8

Here sample 1: flour based noodles, sample 2: Tomato fortified noodles, sample 3: carrot fortified noodles, sample 4: capsicum fortified noodles, sample 5: spinach fortified noodles, sample 6: mixed vegetable fortified noodles.

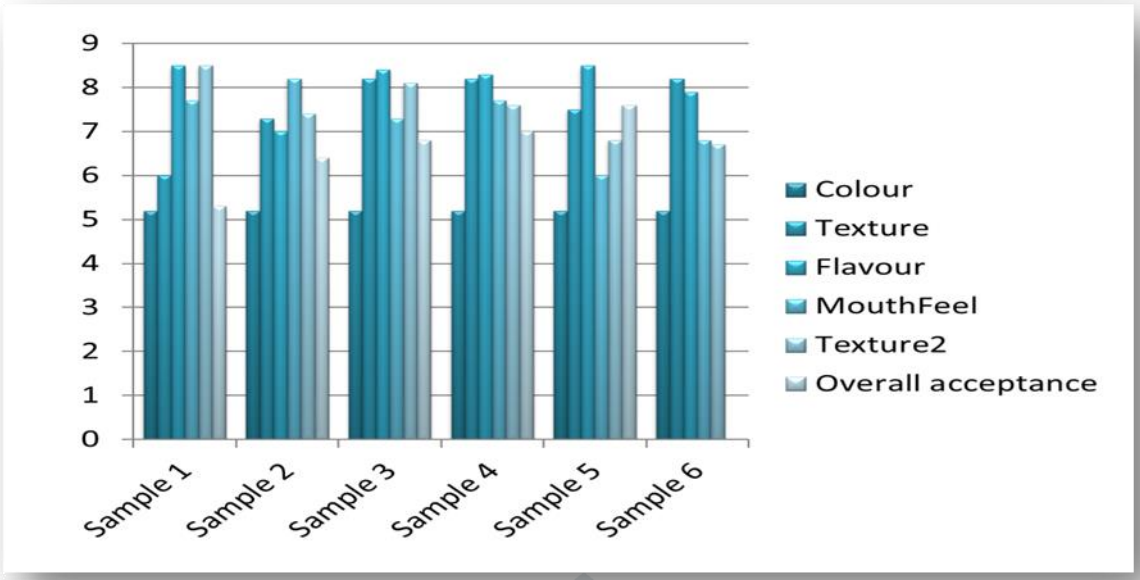
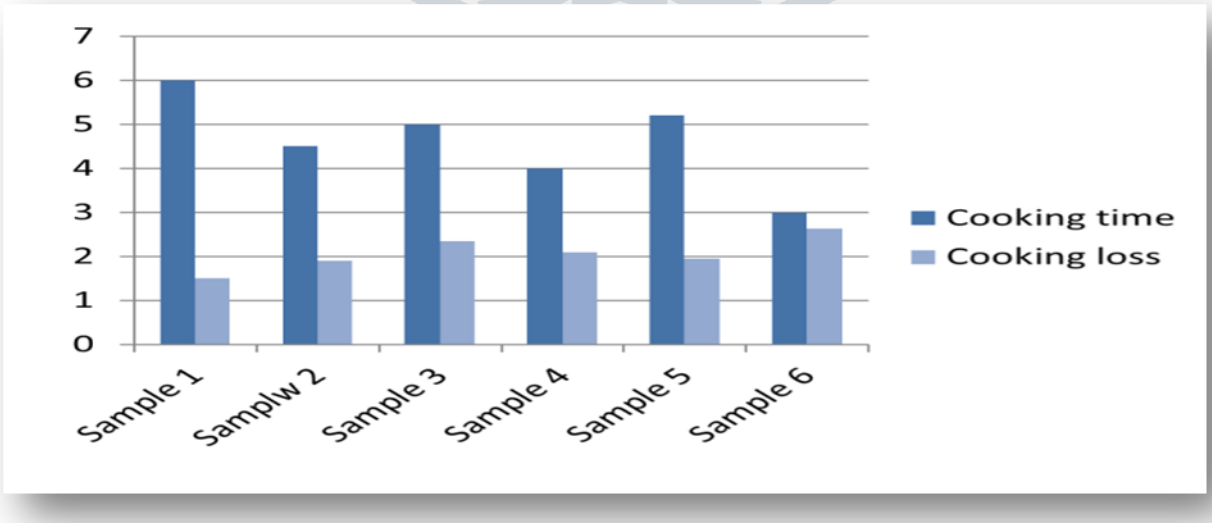


Table 4: Cooking quality of fortified noodles

Sample	Time(min)	Cooking loss (%)
1	6.0	1.5
2	4.5	1.9
3	5.0	2.34
4	4.0	2.1
5	5.2	1.95
6	3.0	2.64

Here sample 1: flour based noodles, sample 2: Tomato fortified noodles, sample 3: carrot fortified noodles, sample 4: capsicum fortified noodles, sample 5: spinach fortified noodles, sample 6: mixed fortified noodles.



4 Conclusion:

Although adults and children both prefer noodles as a snack, noodles made entirely of patent flour are a poor source of dietary fibres, proteins, and minerals. Noodles are an important ready to eat food for our daily routine. Due to low in fiber, and protein, but rich in carbohydrates in noodles, we have prepared fortified noodles adding tomatoes puree, carrots paste, capsicum juice, and spinach paste and mixed of these veg with wheat wholemeal flour. The potential for impact, nutrient retention and bioavailability, sensory alterations, efficacy, and effectiveness should all be taken seriously before a food item is fortified with vitamins and minerals to increase the nutritious consumption of a population. The population's nutritional intake may be advanced through wide food fortification if evidence suggests that these conditions are satisfied. In this study we have performed the entire test to ensure its stability & palatability. Such a product would be appropriate for kids who oppose veggies in addition to being a variety of convenience food.

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