High Fiber Hummus with a Twist of Flavor & Health

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**Product Description and Use**

Hummus, a Middle Eastern dip or spread, is made from cooked garbanzo beans along with tahini, olive oil, lemon juice, salt, and other flavoring agents such as garlic. This versatile product is commonly used in American culture as a dip for fresh vegetables or pita chips, or also as a spread on sandwiches. Hummus can be found in many flavors with ingredients such as chipotle peppers, sun dried tomatoes, pesto, and cilantro.

**Product Formulation and Ingredients**

It was the intention of the research group Food Addicts to modify a conventional food product by enhancing its health beneficial traits while keeping an attractive flavor for a general population, or those attempting to improve their current dietary intake. Hummus was selected because of its popularity and versatility when applied on food. After investigating the current ingredients of hummus, it was found that most recipes out in the market were low in fiber. Therefore, Food Addicts wanted to evolve the traditional hummus recipe to one that would be higher in fiber and potentially possess health benefits.

*Hummus with a Healthy Twist* was developed by incorporating flaxseed meal into the recipe in order to increase the total fiber intake. Food Addicts maintained most of the original hummus recipe ingredients such as lemon juice, olive oil, garbanzo beans, granulated garlic, and salt. The recipe modification included decreasing the original quantity of tahini sauce of 2 table spoons to one 1 table spoon, then adding 2 table spoons of flax seed meal, creating a 2:1 ratio. To create an even more original product, Food Addicts also added cooked corn kernels and fresh cilantro to the recipe to further enhance fiber content, texture and flavor. After the combination of ingredients, all were mixed using a food processor to effectively deliver a smooth, spreadable product.

Dietary fiber is widely recognized as beneficial for human health, and increased intake of certain fibers has been shown to improve serum lipid concentrations, promote regularity of bowel movements, improve blood glucose control, aid in weight maintenance, and improve immune function [1]. Because of these know health benefits, the ultimate goals of Food Addicts were to add fiber to a popular product such as hummus without jeopardizing the flavor integrity. After a nutrient analyzes, *Hummus with a Healthy Twist* was observed to contain an estimated 3 grams of fiber per serving. The Dietary Reference Intakes (DRIs) current recommendation foradults is to consume 14 g dietary fiber per 1000 kcal ingested, which translates into a daily intake of about 25 g for women and 38 g for men [1]. However, average fiber intake in the United States is about half the recommended value, and Americans typically consume only 15 g per day [1]. Therefore, it was speculated that *Hummus with a Healthy Twist* would be a healthier alternative and a great way to increase fiber consumption in the American diet as hummus is already a widely used spread and dip.

*Hummus with a Healthy Twist* evolved over a series of recipe trials into its final stage containing the adequate amount of respective ingredients to achieve the goal of The Food Addicts. Initiating with trial 1, 4 oz. of the canned garbanzo liquid was used, 4 tablespoons of lemon juice, 1 tablespoon of tahini and 1 of flaxseed meal, and ½ cup of cilantro was used. After analyzing the consistency, texture, and flavor, and color, The Food Addicts planned to reform the initial recipe by adding 1 more tablespoon of flaxseed meal to increase the fiber content, decrease the lemon juice content to level the acidity of flavor to 2 ½ tablespoons, add ½ a cup more of cilantro to enhance flavor plus color, and eliminate the garbanzo liquid to increase the viscosity of *Hummus with a Healthy Twist.* Finally, trial 5 presented The Food Addicts with a product containing the expected spread ability, color, flavor, and fiber content; the goal of the research group was successfully met. The final recipe is depicted in table A78, refer to appendices for recipe. Furthermore, laboratory tests such as water activity, pH value and sensory analysis using a paired preference questionnaire were performed to test the effectiveness and stability of *Hummus with a Healthy Twist.* These tests and results are discussed in their respective sections.

**Product Performance**

For the created product, Food Addicts compared *Hummus with a Healthy Twist* to a store bought hummus from Windmill Farms called Oasis Naturals Hummus. The two laboratory tests that were performed and thought to be most relevant were the hygrometer to measure water activity (Aw) and the potentiometer to measure pH; refer to appendices for results shown in tables 1-4.

When paired t-tests were run to compare *Hummus with a Healthy Twist* to the Oasis Natural Hummus, the p values came out to p = 0.54 for the water activity and p < .0001 for the pH. What this means is that *Hummus with a Healthy Twist* compared to a favored hummus out in the market, as clearly seen in Figure 1, bodes well for shelf life. However, *Hummus with a Healthy Twist* had a statistically significant difference in pH compared to the hummus due to the market brand. This can be easily explained due to the larger amount of lemon juice then the ones out in the market, which is very acidic. This could prove to improve shelf life as acidic products tend to have a longer shelf life due to the acid content. Refer to appendices for figures.

**Market Potential**

Hummus consumption has achieved tremendous growth in the United States over the past few years. This growth can be attributed to healthier eating trends and a greater interest in ethnic foods [2]. Americans are traveling all around the world tasting different types of foods and bringing those new foods back home with them. Hummus sales reached nearly 300 million dollars in 2009 and are estimated to keep growing. In 2006, hummus was in 12% of US households, and by 2009 hummus rose to 17% of US households [3].

Hummus consumption may be increasing, but fiber consumption is still relatively low. Only 10% of Americans are getting the recommended amount of fiber in their diets [4]. According to Columbia University Institute of Human Nutrition, the average American barely consumes half of the recommended amount of daily fiber [4]. Many people are confused about what types of foods are rich in fiber. The public does not know there are easy ways to increase your daily fiber intake by eating healthy foods they already like.

*Hummus with a Healthy Twist* is a good source of fiber by containing 3 grams of fiber per 2 tablespoons. Oasis Naturals original hummus contains only 1 gram of fiber, or 4% of the daily recommended fiber per serving. Oasis Naturals original hummus has a small amount of fiber from the chickpeas, but *Hummus with a Healthy Twist* has both soluble and insoluble sources of fiber from the chickpeas, corn, and flaxseed. Oasis Naturals claims their hummus products are vegetarian, low fat, have no artificial flavorings, and are made using healthy oils such as olive oil [5]. *Hummus with a Healthy Twist* has all of these qualities plus more fiber, less fat because of the inclusion of corn, flaxseed meal, and a tasty cilantro flavor.

**Sensory Tests**

Paired preference tests and five point hedonic rating tests were used to evaluate sensory characteristics of *Hummus with a Healthy Twist* and Oasis Naturals original hummus. Affective tests are used to determine if there is a consumer preference of one sample over another and to express a higher degree of liking. The subjects were asked to fill out a questionnaire about their typical hummus consumption, analysis of food labels, and views on health benefits; refer to appendices for sensory questionnaire. In the paired preference tests, a spoonful-sized sample of *Hummus with a Healthy Twist* and original hummus were placed next to each other on a plate with a corresponding code numbers. A pita chip was placed with each sample for tasting. The subjects were instructed to taste each sample and indicate which hummus was preferred. Hedonic rating tests were used to measure the level of liking of the food products by the sample population. The two five point hedonic rating questions were how likely each subject was to purchase each sample and the overall taste of each sample. The five possible answers on the hedonic scale were highly likely, likely, neither like or dislike, dislike, or highly dislike. The results were converted to numerical scores to determine the difference in degree of liking between the samples.

Eighteen subjects participated in the sensory evaluation. None of the subjects smoked cigarettes and 72% identified themselves as typical hummus consumers. One hundred percent of the subjects analyze food labels. The ingredients most analyzed on food labels was varied with 55% concentrating on fat, 17% sugar, 17% fiber, 11% sodium, and 0% protein. When the subjects were asked which of these five ingredients was thought to be the most beneficial, 67% chose fiber and 33% chose protein. Many people know fiber is important but it is not usually analyzed on a food label. Eighty-nine percent of subjects said they would consume a product if the food label indicated health benefits. All subjects said they would consume a product they knew was high in fiber. It would be important to advertise high fiber on the packaging and not just on the food label of the cilantro hummus.

*Hummus with a Healthy Twist* was significantly preferred (p=0.01) by 83% of the subjects compared to the Oasis Naturals original hummus (Figure 2). This hummus was also thought to have health enhancing benefits. Hedonic tests revealed that the created hummus was more likely to be purchased compared to the Oasis Naturals original hummus. *Hummus with a Healthy Twist* averaged 4.5 out of 5 while original hummus averaged 3.4 out of 5 on a scale where 5 was highly likely to purchase and 1 was highly unlikely to purchase (Figure 3). Subjects rated the overall taste of both hummus fairly even with *Hummus with a Healthy Twist* 4.3 out of 5 and the original hummus 4.1 out of 5 (Figure 4).Many people preferred the taste of the *Hummus with a Healthy Twist* so it is important to market this hummus as being healthy and high in fiber. Refer to appendices for figures 2-4.

**Shelf Life Estimated**

In order to estimate shelf life, a comparison was done with a market brand to compare shelf life of both hummus products. Since Oasis Hummus Brand did not have any preservatives and was opened for use during the experimental process, it had a shelf life of approximately 7 days otherwise, if it was not opened, it would have extended to about 2 months. Since the created hummus was technically not packaged the same way as the store bought one, it would be considered homemade hummus, which would have about 2-7 days of shelf life [6].

However, as stated before, *Hummus with a Healthy Twist* was statistically significantly more acidic than the store bought hummus, as seen in Figure 5. In a book written by Budman et al, it is claimed that acidification may also be used in order to prolong the shelf life of food, including hummus, and other dips [7]. Therefore, since the created hummus was more acidic then the store bought brand, it could be surmised that if *Hummus with a Healthy Twist* were to be packaged in a similar manner to the store bought brand, it could potentially have a higher shelf life then the leading brand.

**Regulatory Stipulations**

There are currently no standards of identity for hummus products.

**Product Cost**

The cost analysis was produced using Microsoft Excel with prices and products coming from Windmill Farms. The total recipe cost was $5.41 for 700g of this product, while the cost per serving was $0.18. The entire recipe would yield three 8 oz packages of *Hummus with a Healthy Twist*. Each package would be sold at $4.00. Refer to appendices for cost analysis breakdown, table B77 and Excel document.

**Package Suggestions**

The packaging must create the appropriate storage atmosphere within the package with an adequate balance of oxygen, carbon dioxide, and/or inert gases, and should also provide resistance to mechanical stress in order to create a shelf stable product. Food Addicts decided to use plastic tubs with airtight lids for packaging of the created hummus to provide extended shelf stability.

Currently the trend for hummus packaging among competitors is plastic tubs with lids for easy dipping access. Consumers can dip their chip or pita bread straight into the container, providing convenience and ease. Food Addicts decided to follow the same trend. *Hummus with a Healthy Twist* will also be visually appealing with the vibrant green cilantro blended throughout, which has made the developers decide to use see through containers to advertise the quality of the created product.

The label on a package is the first point of contact between a customer and the producer and it should therefore be considered as part of the marketing strategy. If first time buyers are attracted by the label and enjoy the product, they will continue to buy the same brand and develop a loyalty to it. It is very important to design a label that portrays high quality, exciting taste and a reliable company. Food Addicts will market the brand name and the health benefits of the product in order to be clearly visible for the consumer to see. The label will be vibrantly colored to further attract the consumer’s attention. Many of the hummus products available in the market do not stand out in color; Food Addicts will use a vibrantly colored label in order to stand out from competitors.

Research has been done to prove the advantages of using plastic packaging for food products. An article done by Wireless News found that retailers are pressuring food and beverage manufacturers to use plastic packaging as they are shatterproof and have lesser volume, making them easier to stock [8]. In a second article done by Kenneth Marsh Ph.D. and others, found that there are several advantages to using plastics for food packaging. Because they are chemically resistant, plastics are inexpensive and lightweight with a wide range of physical and optical properties. Many plastics are heat sealable, easy to print, and can be integrated into production processes where the package is formed, filled, and sealed in the same production line [9].

**Nutrition Label**

Food Processor SQL was used to analyze the recipe for *Hummus with a Healthy Twist*. The nutrient content claim described the level of a nutrient or dietary substance in each 2 table spoon serving. Nutrients that qualify for nutrient content claims include: total calories, total fat, saturated fat, cholesterol, sodium, potassium, dietary fiber, sugars, protein, vitamin A, vitamin C, calcium, iron, vitamin D, vitamin E, vitamin K, thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, biotin, pantothenic acid, iodine, magnesium, zinc, selenium, copper, manganese, chromium, molybdenum, chloride, choline, and ALA & DHA omega-3 fatty acids. These claims are used on labels without review by the Food and Drug Administration (FDA), but must comply with all the FDA definitions and regulations.

Health claims are claims made by the food manufacturer that states that their food product will reduce the risk of developing a certain disease. The FDA regulates health claims and structure function claims. It was through the Better Nutrition Information for Consumer Health Initiative, that the FDA concluded that consumers inform themselves more with adequate information on food labels in regards to diet and health [10]. Health claims can be used for dietary supplements and for conventional foods. Health claims differ from structure function claims because health claims characterize the relationship between a substance and its ability to reduce the risk of a disease. On the other hand, structure function claims describe the effect that a substance has on the structure or function of the body and do not make reference to a disease [10]. According to the FDA, in order for a product to be labeled as “low” means that there must be less than 5% of the Daily Value in each serving. The nutrient content claim “good source of” can be used if the product contains 10-19% of the Daily Value of a particular nutrient like fiber, protein, vitamin, or mineral [10]. The term “high” means that the product contains 20% or more of the Daily Value of a particular nutrient.

When comparing the nutrition facts label of *Hummus with a Healthy Twist* (28g) and the Oasis Naturals Original Hummus flavor (28g), *Hummus with a Healthy Twist* cilantro corn flavor was lower in calories from fat, calories, total fat, and sodium. The created hummus was also higher in fiber by 2 more grams per serving than the Oasis Naturals Original Hummus flavor. Based on the standards of the FDA, *Hummus with a Healthy Twist* can be labeled as a good source of fiber and that it is very low in sodium as well. Refer to appendices for the nutrition facts label for both analyzes hummus products.

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**Appendices**

**Table A78:** Final Recipe, Hummus with a Healthy Twist

|  |  |
| --- | --- |
| Ingredient | Amount |
| **Garbanzo beans** | 15oz |
| **Corn kernels** | ½ cup |
| **Granulated garlic** | 1 tsp |
| **Salt** | 1 tsp |
| **Olive Oil** | 2 table spoons |
| **Cilantro** | ½ cup |
| **Tahini** | 1 table spoon |
| **Flaxseed** | 2 tablespoons |
| **Lemon Juice** | 2 ½ tablespoons |

**Table 1: Water Activity of Hummus with a Healthy Twist**

|  |  |
| --- | --- |
| **Trial #** | **Aw­** |
| 1 | .948 |
| 2 | .942 |
| 3 | .940 |
| **Totals** | **.943 ± .004** |

**Table 2: Water Activity of Oasis Natural Hummus**

|  |  |
| --- | --- |
| **Trial #** | **Aw** |
| 1 | .952 |
| 2 | .937 |
| 3 | .934 |
| **Totals** | **.941 ±.010** |

**Table 3: pH Levels of Hummus with a Healthy Twist**

|  |  |
| --- | --- |
| **Trial #** | **pH** |
| 1 | 4.40 |
| 2 | 4.41 |
| 3 | 4.42 |
| **Totals** | **4.41 ± 0.01** |

**Table 4: pH Levels of Oasis Natural Hummus**

|  |  |
| --- | --- |
| **Trial #** | **pH** |
| 1 | 5.00 |
| 2 | 4.92 |
| 3 | 4.91 |
| **Totals** | **4.94 ±0.05** |

**Figure 1: Graph of Water Activity**

**Water Activity (Aw­)**

**Trial #**

**Figure 2: Hummus preference**

Sensory Analysis

1. Do you smoke cigarettes? YES NO
2. Are you a typical hummus consumer? YES NO

1. Do you analyze food labels? YES NO
2. Which ingredient do you analyze on a food label?

Protein Fiber Fat Sodium Sugar

5. Which of these ingredients do you find to be most health beneficial?

Protein Fiber Fat Sodium Sugar

6. If a food label indicated health benefits, would you consume this product? YES NO

7. If you knew a product was higher in fiber would you consume it? YES NO

8. Which of these two samples do you prefer?

A14 B16

9. Which of these two samples do you believe has enhancing health benefits?

A14 B16

10. How likely are you to purchase this product?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A 14 | Highly likely | Likely | Neither likely nor  Likely | Unlikely | Highly Unlikely |
| B 16 | Highly likely | Likely | Neither likely nor  Likely | Unlikely | Highly Unlikely |

11. Overall taste

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A 14 | Highly Like | Like | Neither like nor  Dislike | Dislike | Highly unlike |
| B 16 | Highly like | Like | Neither like nor  Dislike | Dislike | Highly unlike |

**Figure 3: Likelihood of purchasing *Hummus with a Healthy Twist* and original hummus**

**Figure 4: Overall taste of *Hummus with a Healthy Twist* and original hummus**

**Figure 5: pH differences between Hummus with a Healthy Twist and Oasis Naturals Hummus**

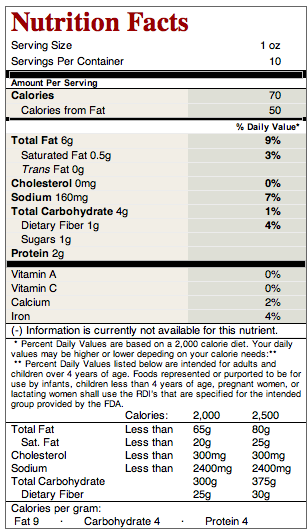
**Trial #**

**pH**

**Table B77: Budget Analysis for *Hummus with a Healthy Twist***

|  |  |  |
| --- | --- | --- |
| **Budget Analysis** | |  |
| **Product** | **Amount Purchased** | **Price** |
| Corn | 4 | $5.66 |
| Cilantro | 2 | $1.13 |
| Pita Chips | 2 | $11.98 |
| Garbanzo Beans | 8 | $14.32 |
| Olive Oil | 1 | $7.89 |
| Flax Seed | 1 | $4.49 |
| Lemons | 6 | $4.37 |
| Sesame Tahini | 1 | $6.69 |
| Original Hummus | 2 | $7.58 |
|  | **Total** | **$64.11** |

**Nutrition Facts Label for Oasis Naturals Original Hummus Flavor**



**Nutrition Facts for Hummus with a Healthy Twist**

