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RESEARCH ARTICLE

THE USE OF OATS AND SOYA BEANS IN THE PREPARATION OF FOOD SUPPLEMENT

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Abstract

The advancement of convenient food from available raw materials has received a lot of attention but not for all cereals and legumes. This research was aimed to produce highly convenient food made from oats and soya bean flour for the production of food supplement. An experimental research design was used for the study. Contextually 24 respondents were purposively and conveniently sampled and questionnaire was used to sensory analyse primary data. Results were analysed using SPSS, frequency tables and graphs. Majority of the respondents stated that they did not know oats and soya beans could be used as food supplements. Again, as the appearance and taste of oaty-soya bean meal was excellent, the colour, aroma, after taste and texture was good. Conclusively, oats and soya beans used as a food supplement attained a high overall mean score. Most respondents strongly agreed that oats and soya beans supplement should be produced for sale. Similarly, the product is best to consume as a natural food supplement rather than the artificial ones consumed by humankind. Commendably, the general public should be urged to consume oaty-soya bean meal for the nutritional benefit as well as serve as a convenient food for all. Products should be introduced to the market so that humankind would patronize it more than the artificial food supplements.

Introduction:-

The food choices selected by humankind each day, affect the health, today, tomorrow, and the future (Health Human Service (HHS), 2017). Good nutrition is an important part of leading a healthy lifestyle. This, combined with physical activity, and a good diet can help you to reach and maintain a healthy weight, as well as reduce risks of chronic diseases for the overall well being of human health (HHS 2017, Schulze, 2018). Dietary habits established in childhood are often carried into adulthood. As a result, teaching children how to eat healthy at a young age will help them stay healthy throughout their life. The link between good nutrition and healthy weight, makes people stay healthy (HHS, 2017, Schulze, 2018). Food is a composite mixture of various ingredients that are consumed for nutrition (Quddusi, 2018). This has led to the introduction of food supplements which are concentrated sources of nutrients termed as nutritional supplements (The European Food Information Council, 2013).

The European Food Safety Authority (EFSA, 2012) defines food supplements as concentrated sources of nutrients which has physiological effects on a normal diet. The idea behind food supplements, also called dietary or

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nutritional supplements, is to provide nutrients that may not be consumed in sufficient quantities. Artificial food supplements can be vitamins, minerals, amino acids, fatty acids and other substances delivered in the form of pills, tablets, capsules, and liquids which are available in a range of doses of different combinations (Troesch, 2012). Oats are annual grasses, and are used for both human and animal nutrition, in addition to other purposes and they are a commonly grown crop in the world today. However, they bring with them somewhat tempestuous history. Modern oats probably originated from the Asian wild red oats which grew as a weed in other grain crops (Vandaveer, 2004). According to Luis (2005), and Qiu and Chang (2010), the soya beans (Glycine max), is a species of legume native to East Asia, widely grown for its edible beans, which has numerous uses. Fat-free (defatted) soya beans meal is a significant and cheap source of protein for animal feeds and many packaged meals. For example, soybean products, such as textured vegetable protein (TVP), are ingredients in many meat and dairy substitutes (Pagano & Miransari, 2016).

Oats are cereal crops or grains used as porridge, as an ingredient in breakfast cereals or baked products (Nordqvist, 2018). Oats are loaded with dietary fiber (containing more than any other grain) and have a range of healthy cholesterol lowering properties. Soy beans, which are also known as soya beans, are spices of legumes of the pea family that have become one of the most widely consumed foods in the world. They are extremely useful for human health, easy to cultivate and contain all the six food nutrients (Staughton, 2019). As soya beans provide essential fiber needed for a healthy lifestyle, oats also provide powerful soluble fiber and improve blood sugar control (Hrefna Palsdottir, 2016, Nordquist, 2018). It also contains essential amino acids, unsaturated fatty acids, carbohydrates, vitamins and minerals.

Nutritional Value of Oats and Soya Beans

Oats are rich in a specific type of fiber called beta-glucan. This particular type of fiber is known to help lower levels of bad cholesterol (Whitehead, Beck,Tosh & Wolever, 2014). Soybeans are very rich in nutritive components. Besides the very high protein content, soybeans contain a lot of fibre and are rich in calcium, magnesium. The soy protein has a high biological value and contains all the essential amino acids. Soya beans are rich in unsaturated fatty acids and low in saturated fatty acids, which need to be avoided. The nutritional components per 100 grammes are presented in Table 1 and 2.

Table 1:- Nutrients Present in 100g of Dried Oats.

Food Nutrient	Quantity
Calories	389
Water	8%
Protein	16.9grams
Carbohydrates	66.3grams
Sugar	0grams
Fiber	10.6grams
Fat	6.9grams

(United States Department of Agriculture (USDA), 2019, Sterna, 2016, Ahmad, 2010)

Table 2:- Nutrients Present in 100g of Dried Soya Beans.

Food Nutrients	**Quantity**
Water	8.5l
Energy	1741kJ
Protein	36.5g
Fat (total lipid)	19.9g
Fatty acids, saturated	2.9g
Fatty acids, mono-unsaturated	4.4g
Fatty acids, poly-unsaturated	11.3g
Carbohydrates	30.2g
Fiber	9.3g
Ash	4.9g
Isoflavones	200mg
Calcium, Ca	277mg
Iron, Fe	15.7mg
Magnesium, Mg	280mg

Phosphorus, Mg	704mg
Potassium, K	179mg
Sodium, Na	2.0mg
Zinc, Zn	4.9mg
Copper, Cu	1.7mg
Manganese, Mn	2.52mg
Selenium, Se	17.8µg
Vitamin C (ascorbic acid)	6.0mg
Thiamin (vitamin B1)	0.874mg
Riboflavin (vitamin B2)	0.87mg
Niacin (vitamin B3)	1.62mg
Panthotenic acid (vitamin B5)	0.79mg
Vitamin B6	0.38mg
Folic acid	375µg
Vitamin B12	0.0µg
Vitamin A	2.0µg
Vitamin E	1.95mg

(Whitehead et al , 2014, Lisa , 2002, Head, Fasselt, kadish, Smith &Yube 2010)

Dietary supplements cannot replace complete meals which are essential to nurturing the body. Many supplements also contain active ingredients like monosodium glutamate that have strong biological effects and are harmful. It is sad to say that artificial food supplements which are unhealthy and dangerous are what is mostly consumed by humankind (Dickson & Mackay, 2014). Currently, dietary supplements or food supplements made from oats and soya beans that contain high amounts of essential nutrients, vitamins, minerals, protein, carbohydrate as compared to other dietary supplements have not been massively utilized by consumers. Furthermore, most consumers prefer the non-food supplements (artificial) sources rather than those from raw food due to some scanty knowledge on the importance of oats soya meal recommended as food supplements. In view of the above, food described as medicine became the prime motivator leading to the development of a natural food supplement from oats and soya beans (Oaty-Soya Meal) to replace artificial ones.

Generally, the study aimed to produce natural food supplements made from cereals and legumes. Based on this, the objectives of the study were to:

1. Process oats and soya beans into flour.
2. Produce a natural food supplement from oats and soya beans to replace artificial ones.
3. Evaluate sensory analysis feedback of the product.
4. Assess consumer acceptability.
5. Analyse the physicochemical components of oaty-soya beans

Importance of Sensory Evaluation

The importance of sensory perception to food quality was widely appreciated in the food industry, providing a demand for such specialists. Like other quantitative disciplines, sensory evaluation attempted to provide precise and accurate measurements (Walker, 2024). Yet, because data were collected from human beings, who were notoriously variable, sensory evaluation studies pose a special challenge, and statistical techniques were necessary (Cooke, 2014). **Aroma/Flavour** resulted from compounds that were divided into two broad classes as pleasant smell or unpleasant smell. Pleasant smell is where a product has a good quality smell or flavour of something that you notice when you breathe in through your nose likewise to an unpleasant smell which has bad quality smell and it could be harmful (Mustafa & Chin, 2023). Compounds responsible for **taste** are generally nonvolatile at room temperature. Therefore, they interact only with taste receptors located in the taste buds of the tongue. The four important basic taste perceptions are provided by: sour, sweet, bitter and salty compounds and glutamate stimulates the fifth basic taste; umami (Doty, Chen, & Overend, 2017; Mustafa & Chin, 2023) Again, these authors affirm that a sweet product is mostly described as tasty when it is good.

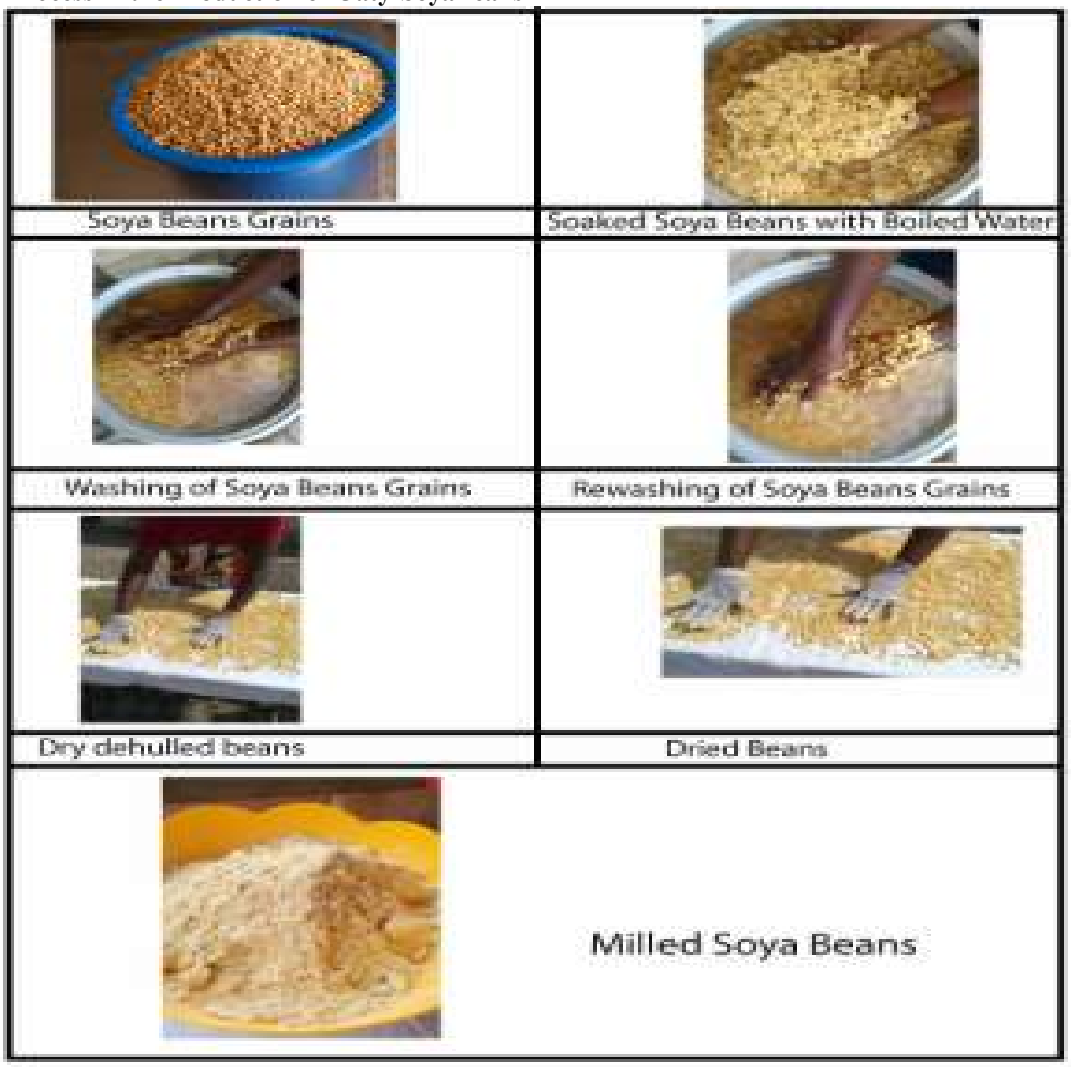
Appearance describes raw food and manufactured product that has an acceptable or good range of colour appearance that depends on factors associated with the consumer and the nature of the surroundings. Food appears in two principal factors, the physical and the psychological (Koç, & Atar Kayabaşi, 2023) and the presentation is just as essential to the success of a dish as its taste and flavour. The way the food looks on the plate is what tempts

our eyes and makes you want to taste it (Koç, & Atar Kayabaşi, 2023). **Colour** is derived from the natural pigments in fruits and vegetables, many of which change as the plant proceeds through maturation and ripening. Colour and appearance attract consumers to a product and can help in impulse purchases (Stella, 2017). **Food Texture** is a collective term of sensory experiences originated from visual, audio and tactile stimuli. It refers to how the physical attributes of a food texture are processed by the brain during mastication. Characteristics like hard, soft, crispy, crunchy, are used by consumers to describe food texture (Akinoso, et al., 2021; Yousuf, et al., 2023). Consumer concern and interest in food texture vary from one type of food to another.

Materials and Method:-

Research design adopted was experimental and the target population were final year students of the Hospitality Management Department who generalize the study findings. In the study, a sample size of 72 was considered adequate for the study. Purposive sampling was used to select the students as respondents, because they were into food production. Again, they were students who had undergone training in product development and were researching recipe development as part of their final thesis. Convenience sampling technique was also used to select 72 respondents from Hospitality Management Higher National Diploma 3 students out of 101 students in the class. Product was developed at the food laboratory and a questionnaire was administered for respondents to sensory analyse.The ingredients used for the food supplement included oats flour, soya beans flour, milk powder and margarine. These were purchased from the Takoradi Market Circle. Results were analyzed systematically and presented into frequency distr tables and bar charts for easy and graphical understanding.

Pictorial Process in the Production of Oaty-SoyaBeans




Milled Oats and Soya Beans
200g of Milled Oats
200g of Milled Soya Beans
20g of Fat
Mixing of Fat and Milled Oats
Mixing of Fat and
Roasting of Soya Beans
Roasting of Oats

Ingredients Needed for the Production of Oaty-Soya Beans Meal
Soya beans – 200g
Oats – 200g
Dried milk – 100g
Fat – 40g

Method:-

- Weigh 200g oats and mill to get a floury texture
- Remove stones, chaff, dirt and foreign matter from soya beans
- Wash soya beans, soak for 30 minutes, deskin and boil for 20 minutes
- Dry soya beans thoroughly and weigh 200g
- Mill the soya beans to get a floury texture
- Roast soya beans with 20g fat at a temperature of 100°C for 30 minutes
- Roast oats with 20g fat at a temperature of 100°C for 10 minutes
- Blend oats and the soya beans together when cooled and mix with 100g dried milk
- Store in airtight containers ready for use

- Mix with boiled water to get a thick consistency like porridge or with lots of water and drink as a beverage

Results:-

This section outlined general information of respondents' knowledge on oats flour and soya beans flour. It also explored to find out if respondents knew about oats and soya bean products which served as food supplements. Furthermore, it discussed the sensory domains, customer acceptability and unveiled the nutrients present in the consumption of 100g.

Table 3:- General information on Oats and Soya Beans.

General information on Oats and Soya Beans	Yes(%)	No(%)
Do you know about oats flour?	70.8	29.2
Do you know of soyabeans flour?	83.3	16.7
Do you think oats and soya beans flour can be used as a food supplement?	79.2	20.8
Have you come across products made from oats and soya beans?	41.7	58.3

Source: Field Survey, 2024

Sensory Evaluation

The study assessed the sensory characteristics of food supplements prepared from oaty-soya beans meal. From the analysis in Table 4, most of the respondents stated that the appearance (62.5%) and taste(54.2%) of food supplements prepared from oaty-soya beans were excellent with a corresponding mean response of 4.54 and 4.42 respectively. As more than fifty percent of the respondents stated that the colour (58.3%) of the foodsupplement prepared very good, less than 50% affirmed that the aroma was good (41.7%). Most of the respondents (37.4 and 37.6%) affirmed that the after-taste of a food supplement prepared from oaty-soya beans was good and excellent respectively. Again, some respondents (37.6 and 37.4%) stated that the texture of the food supplement prepared from oaty-soya beans was very good and excellent.

Table 4:-Sensory Evaluation of Oats-Soya Beans Meal (% in agreement).

Product composition	Good	Very Good	Excellent	Mean
Appearance	8.3	29.2	62.5	4.54
Colour	25.0	58.3	16.7	3.92
Taste	12.5	33.3	54.2	4.42
Aroma	37.5	41.7	20.8	3.83
After-taste	37.4	25.0	37.6	4.00
Texture	25.0	37.6	37.4	4.13
Overall				**4.14**

Source: Field Survey, 2024

Consumers Acceptance

The primary objectives of this section evaluated consumer's acceptance of food supplements prepared from oaty-soya beans as food supplements. The analysis in Figure 1 indicated whether respondents would like oats and soya bean supplement to be produced for the Ghanaian market and the world at large.

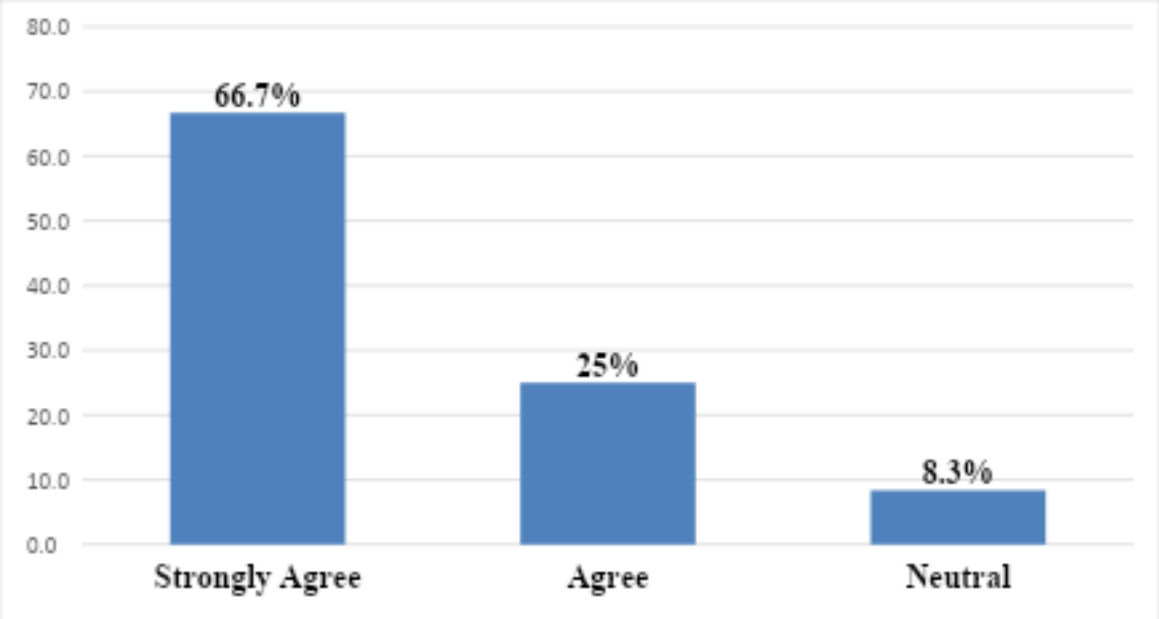


Figure 1:- Oats and Soya Beans Accepted by Consumers
Source: Field Survey, 2024

Physicochemical Analysis of Oaty-Soya Beans
Table 4:- Nutrients Present in 100g of Oaty-Soya Beans.

Food Nutrients	Quantity
Calories	925g
Water	8.25l
Protein	35.25g
Sugar	10g
Fat	13.6g
Fatty acids, saturated	5.6g
Fatty acids, unsaturated	2.2g
Carbohydrates	48.25g
Fiber	9.95g
Ash	2.45g
Calcium, Ca	138 mg
Iron, Fe	7.85 mg
Magnesium, Mg	140 mg
Phosphorus, Mg	352 mg
Potassium, K	89.5mg
Sodium, Na	1.0mg
Zinc, Zn	2.45mg
Copper, Cu	0.85mg
Manganese, Mn	1.26mg
Selenium, Se	8.9µg

Source: Field Survey, 2024

The proximate and mineral components of the product contained twenty nutrients. Protein, carbohydrates, fats, minerals and water assessed with their quantities are present in Table 4. The result depicted that all essential nutrients needed for human survival were present in their correct proportion.

Discussion:-

General Information on Oats and Soya Beans

This general information about oats and soya beans revealed that the majority of the respondents (70.8%) indicated that they know of oat flour whilst most of the respondents (83.3%) again indicated that they know of soya bean flour as shown in Table 3. Again, majority of the respondents recording 79.2% indicated that oats and soya beans flour could be used as a food supplement. Furthermore, slightly more than half (58.3%) affirmed that they have come across a product made from oats and soya beans. This research was in line with Hrefna Palsdottir (2016) and Nordquist (2018). who affirmed that as soya beans provide essential fiber needed for a healthy lifestyle, oats also provided soluble fiber and improve blood sugar control hence its importance to combine as food supplement.

In sum, it could be deduced that the overall grading of food supplements prepared from oaty-soya beans was good recording a mean response of 4.14. As all means were more than 3.5, it could be concluded that the sensory analysis of the product was at least good. Linking this to the reviewed literature affirms that the way food looks on the plate is what tempts a consumer to want to taste a product (Koç, & Atar Kayabaşi, 2023). Also, Doty, et al., (2020) postulated that a sweet product which is tasty attains an excellent assessment, while Mustafa and Chin (2023), confirmed that a product ought to be at least good when it has a pleasant smell per the sensory assessment of a respondent.

Here a greater proportion of the respondents (66.7%) strongly agreed that they would like oats and soya bean supplement to be produced for the Ghanaian market and the world at large, 25% of the respondents also agreed that they would recommend oats and soya bean supplement to be produced for the Ghanaian market and the world at large. More so, 8.3% of the respondents neither agreed nor disagreed whether they would like oats and soya bean supplement to be produced for the Ghanaian market and the world at large.

The twenty proximate and mineral component present in the oaty-soya bean food supplement is nutritious since it contains all the required food nutrient although vitamins were not assessed. In sum it could be deduce that, most of the respondents would like oats and soya bean supplement to be produced for the Ghanaian market and the world at large.

Conclusions:-

Based on the findings the following conclusions were made; It was evident from the study that most of the respondents knew of oats and soya bean flour. Again, most of them had come across products made from oats and soya beans. The study also concluded that the appearance, and taste of food supplements prepared from oaty-soya bean meals was excellent. and the colour, aroma, after taste and texture of oaty-soya beans meal was at least good. In all it was evident that the overall grading of food supplements prepared from oaty-soya beans with an overall mean attainment of 41.4 was good. Finally a greater proportion of the respondents recording 66.7% strongly agreed that they would like oats and soya bean supplement should be produced for the Ghanaian market and the world at large. Additionally, the nutrients presents in oaty-soya beans can be well described as a balanced food supplement which should be taken in place of artificial supplement.

Recommendation:-

1. The general public should consume oaty-soya beans because it has a good nutritional and health benefit as well as serve as a convenience food for all.
2. It is also recommended that the product should be introduced to the market since it could serve as a food for all and humankind should patronize it more than the artificial food supplements.
3. Future researchers could produce the product and assess the vitamin component of the oaty-soya beans.

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