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DEVELOPMENT OF POTATO BASED PROTEIN ENRICHED (OKARA) SOUP POWDER.

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Abstract

Premix for Potato-Based Protein-Enriched Soup: A Helpful and Supplement Thick It is becoming increasingly difficult to meet the growing demand for sustainable, healthy, and convenient food options. Accordingly, the improvement of potato-based protein-enhanced soup premixes has acquired consideration as a down to earth arrangement. The nutritional value, ease of use, and adaptability of potato-based protein-enriched soup premixes are highlighted in this abstract, which provides an overview of their main features and advantages. Dehydrated potatoes and plant-based protein sources like grains, seeds, or legumes are combined to create potato-based protein-enriched soup premixes. The premixes are painstakingly created to guarantee a fair mix of macronutrients, including proteins, complex carbohydrates, and dietary fiber. Not only does this combination improve the soup's nutritional profile, but it also offers as a satisfying meal option. The premixes offer a helpful answer for people looking for a fast and simple method for setting up a protein-rich feast. The availability of a pre-packaged soup mix makesmealpreparationsimplerandmoreaccessibletoawiderangeofcustomerswholeadbusylivesandarelimited on time. The incorporation of dried out potatoes adds substance and flavor as well as contributes fundamental supplements like L-ascorbic acid, potassium, and, further improving the dietary benefit of the soup. Additionally, potato-based protein-enriched soup premixes are adaptable, facilitating personalization. Vegetables, herbs, and spices are just a few of the additional ingredients that can be added.The premixes are suitable for vegetarian, vegan, and gluten-free diets thanks to their adaptability.

Key words: foam mat drying, water solubility, hydrocolloids, gelatinization, okara, wet milling, isoflavinoids

1. Introduction

Potato, a starchy, tuberous crop from the perennial Solanumtubero sum of the Nightshade family, also known as 'The king of vegetables', has emerged as fourth most important food cropinIndiaafterrice,wheatandmaize.Indianvegetableba sketisincompletewithoutpotato. There are about 5,000 potato varieties worldwide. It is consumed globally as a rich source of carbohydrate. It constitutesnearlyhalfoftheworld'sannualoutputofallroot andtubercrops. With an annual global production of about 300 million tonnes, potato is an economically important staple crop in both developed and developing countries. China is now the world's largest potato-

producing country, and nearly a third of the world's potatoes are harvested in China and India. Being a short duration crop, it produces more quantity of dry matter, edible energy and edible protein in less as compared to cereals like rice and wheat. Hence, potato is considered to be an important crop to achieve nutritional security of the nation.

Being a highly perishable item, in India millions of metric ton of potatoes are lost every year and only 0.5-1% are processed. Employing an ideal preservation technique for potato will increase the shelf life, diversify its usability, help in development of some innovative food products, as well as increase its international market value.

Prior to drying most food products are usually subjected to one form of pretreatments; among other methods hot water blanching is one of the most common techniques. Potato blanching helps inactivate enzymes that lead to some quality degradations. Blanching also facilitates starch gelatinization that leads to the change of internal structure and influences the drying rate and quality of the dried product.

Especially in case of potato starches where the starch granules are larger than other cereal starches. Blanching can be coupled with hydrothermal treatment or high pressure cooking for proper gelatinization. Extent of gelatinization can be measured by enzymatic hydrolysis of starches to simple sugars. Gelatinization of starches increased their susceptibility to enzyme degradation, in comparison to their native form.

Drying is one of the cheapest methods of food processing and preservation. Drying is defined as 'the application of heat under controlled conditions to remove the majority of the water normally present in a food by evaporation'. It is a method which inhibits the growth of microorganisms and has been practiced worldwide since ancient times to preserve food.

The selection of drying technique for foods is more critical as the selected technique should be good in both ways; the quality as well as the cost involved. Many of the food products are low valued products and use of expensive techniques such as freeze drying is not recommended although the product quality can be superior. Hence it is necessary to critically evaluate the steps involved in classification and selection of drying techniques and dryers for food products.

Foam mat drying originally was developed by Morgan et al. in 1959 at the Western Regional Research Laboratory of the U.S. Department of Agriculture. The foam-mat process involves drying thin layers of foamed material in heated un-dehumidified air at atmospheric pressure and is reported to be considerably cheaper than vacuum, freeze and spray drying methods. Thefoam matdryingisaprocessinwhichthetransformationofproducts fromliquidtostable foamfollowsairdryingatrelativelylowtemperaturestoformathinporoushoney-combsheetormatwhichisdisintegratedtoyieldafree-flowingpowder.Thedriedproduct obtainedfrom foam-mat drying is of better quality, porous and can be easily reconstituted. Concentration of the material prior to conversion into stable foam may or may not be an essential requirement and will depend on surface tension and consistency of the product. In spite of the fact that a largevolumeofgaspresentinthefoamedmassimpedestheigherrateofheat transfer, drying rate is comparatively high because of enormous increase in liquid-gas interface. The advantages of the foam-mat drying process include relatively fast drying, easy reconstitution and better quality product. The renewed process is of potential interest in foam-mat drying for developed and developing countries for its simplicity, rapid drying at lower temperature, suitable for all type of fruits and vegetables, retention of nutritional quality and cost effective for producing easily re-constitutable powders.

Soup is a fundamentally a fluid which is ready from vegetables, fish or meat utilizing with water, squeeze or stock and a few thickening specialists and fall under heterogeneous class of food. There are typically two kinds of soup: clear soup and thick soup. Fast-cooking instant soup is almost ready for consumption. By covering a wide range of dried foods, it plays an important role in maintaining people's nutrition. The global market has a significant demand for dry soup mixes. The physiochemical and rheological properties of the instant soup at the timeofpreparationtypicallyplayasignificantroleincommercialproduction.Inpointoffact, rheological characters are concerned with the flow and deformation of matter. Consequently, rheologicalparametersarenecessarytocomprehendthestructureofthefood'sbehaviorduring processing. Since this soup can add a significant amount of protein to the diet, it can help to reduce protein deficiency.

Potatoes are well-known for their adaptability and nutritional value, which accounts for their widespread consumption worldwide. Complex carbohydrates, dietary fiber, vitamins (such as vitamin C and vitamin B6), and minerals (such as potassium) are all abundant in them. However, when comparedtootherfoodsources,potatoeshavearelativelylowproteincontent. As a result, in order to improve the nutritional profile, we have created potato-based soup premixes with added protein. These soup premixes

may contain plant-based proteins, such as soy, as an additional source of protein. This guarantees an assorted scope of choices to take care of various dietary inclinations, including vegetarian decisions.

Dehydrated powder or granules of potato flakes, protein powders, seasonings, and other ingredients typically make up the soup premixes. To set up the soup, you commonly need to reconstitutethepremixwithheatedwaterandstewitforacoupleofmomentsuntilitthickens to the ideal consistency.

2. Objective of the studies:

- Healthful Equilibrium: The premix intends to offer a balanced feast choice by joining the advantagesof potatoes, which are good starchy diet with added protein. The goal is to make an item that gives fundamental macronutrients, including carbohydrates, proteins, and fats, as well as significant micronutrients like nutrients and minerals.
- Comfort: The premix is intended to be a helpful and efficient answer for individuals whoneedafastandsimple dinner. By givingapre-cooked item with Carbohydrate, protein fibre on the planning system, permitting people to set up a nutritious soup without the requirement for broad cooking or fixing determination without any problem.
- Satiety and Energy: The protein enhancement in the soup premix means to build its satiety esteem, assisting people with feeling more full for longer in the wake of consuming the soup. This can be valuable for those, who are hoping to deal with their weightorcontroltheircraving. Furthermore,theblendofcarbohydrates andproteinscangivea supported arrival of energy, making the soup a wonderful and feedingchoice.
- Dietary Adaptability: The goal might be to take care of different dietary inclinations and limitations. By utilizing a potato base, the soup premix could be reasonable for people following veggie lover or vegetarian consumes less calories. It might likewise be sans gluten and appropriate for those with gluten narrow mindedness or responsiveness, contingent upon the particulardetailing.
- TasteandFlavor:Whiletheessentialgoalistogive anutritioussoup, thepremixreally should likewise have a pleasant taste and flavor meeting their nutritious requirements so it was redone with extra vegetables, spices, or flavors to suit individual taste inclinations.

By and large, potato based protein enhanced soup pre-blends offer a helpful, nutritious, inventive, tasty method for partaking in a protein-stuffed soup that use the advantages of potatoesandothergreatproteinsources.Whetheryou'reloo kingforaspeedyandsimplefeast at home or a delightful choice in foodservice foundations, these premixes give a flexible and healthy arrangement.

Contingent upon the soybean varietal utilized, okara can have huge amounts of fat making it a conceivable material for lipid extraction. Oil from Okara was extracted using supercritical carbon dioxide by Quitain and others (2005). Oil yields were 3.09g per 100g of dried okara. This yields approximately 25% (assuming 12g/100g of total oil for extraction from dried okara). If 5 mol% ethanol and 10 mol% ethanol are added as an entrainer to the supercritical carbon dioxide, yields rise to 4.54g/100g and 7.81g/100g sample (64 percent recovery). This highreturnmakesextractionofoilpartsfromokaraafeasible process.Genisteinanddaidzein, twoisoflavones,werealsoextracted togetherwiththeoils.Thisenhancestheoilrecuperation process as these is flavones are credited with positive wellbeing impacts like cell reinforcement capacity, calming properties, against mutagenic capacity from there, the sky is the limit (Quitan,2005).

The vegan and vegetarian market is open to soy products.

The high protein content in soy makes it an appealing food hotspot for people who Missthemarkongreatproteinsourceintheireatingregimens,andhaspromptedafewpeople making soymilk at home. As a result, there has been an increase in the number of blogs on the internet (www.okaramountain.blospot.com) where people share recipes and ways to use okara. The home cook can undoubtedlymakeutilization of little amounts of okara by freezing the extra mash until sometime in the future, consequentlykeepingitnew,though enormous cope creation linesfindcapacityofthecrude okaraan issue. It is undesirable to use a product that is highly perishable as an ingredient in food formulations because of its distribution andstorage.

Okara can have a lot of moisture after the soymilk has been extracted, which is why it needs to be dried.

Many researchers have looked into ways to dry this material so that it can be transported and stored easily.

Materials and Methods

MATERIAL AND EQUIPMENT

- **MATERIALS:**
  - Potato (as base Carbohydratesource)
  - Soybean (as Proteinsource)
  - Lemon (as Coagulatingagent)
  - Spice mix (as Flavoring agent)
  - Sodium Alginate (as hydrosol)
  - Glycerol Monostearate (GMS), Oil, Water (as Emulsifier for Foam MatDrying)

- **EQUIPMENTS:**
  - Weighing Balance
  - Mixer Grinder
  - TrayDryer
  - Spatula
  - MixingBowl
  - MuslinCloth
  - GasBurner

METHODOLOGY

- PART I (POTATOPOWDER):

POTATO POWDER PRODUCTION FLOWSHEET:

Raw Material Procurement (Potatoes)
↓
Washing the Potatoes
↓
Slicing thePotatoes
↓
Peeling thePotatoes
↓
Blanching thePotatoes
↓
Water at 80°C + 2% NaCl + 250ppm KMS
↓
Wet Milling the blanched Potatoes
↓
Water at 80°C + 2% NaCl + 250ppm KMS
↓
Wet Milling the blanched Potatoes

Potato Paste
↓
Addition of emulsifying agent GMS: oil : water 1:1:8
↓
Foamed mixture Foaming is done in mixer grinder

The foam paste subjected to drying in Tray dryer at 65oC for 2 hrs
Potato flakes are formed
Milled to form potato powder
Slurry of potato paste for Foam mat dryinng Potato powder

- PART II (OKARAPOWDER):

OKARA POWDER PRODUCTION FLOWCHART:

Raw Material Procurement (Soybeans)
↓
Soy bean was soaked overnight in cold water
↓
Dehulling of soybean to remove the hull.
↓
Wet milling of water with de- hulled soy grits: water 1:2 in a mixer grinder
↓
Soybean paste was prepared
↓
The paste was filtered with double walled muslin cloth
↓
The solid residue was separated as okara (wet)
↓
The wet okara was dried in a Tray dryer at 65oC to form the okara powder
↓
The solid mass was grinded and sieved to get the okara powder

Sanple okara Powder

➢ PART III (SOUPPRE-MIX):

SOUP PRE-MIX PRODUCTION FLOWCHART:

Spice mixture was prepared by Garlic powder, Onion powder, Ginger powder red chilli and Coriander powder

Potato powder + okara Powder + Spice mixture + salt + sodium Alginate.

↓

Soup premix was prepared

SOUP PRE-MIX PRODUCTION STEPS:

1. Spice mix is prepared which contains garlic powder, onion powder, ginger powder,redChilli powder, Corianderpowder.
2. To this sugar and salt are also added.
3. Sodium alginate is added which acts as a hydrocolloid and prevents from lump formation.
4. Finally potato powder, okara powder, spice mix, salt, sugar, sodium alginate are mixed all together to get our final desired product which is potato based protein enriched soup premix.
5. It is packed in airtight packets for future use.

Different soup premix mixture.

➢ **QUALITY ANALYSIS OF RAWMATERIALS:**

I. Raw Soybeans:

- Visual Assessment: This involves looking at the soybeans to determine their overallappearance,color, size, and shape, as well as whether they have any flaws or foreign materials.Soybeansofhighqualitytypicallyhave uniformsize,shape, color, and lack of impurities.
- Smell Test: The fragrance of soybeans can give significant data about their newness and potential for handling. Any rancidity or off-flavors that could compromise the soybeans' quality can be detected by skilledprofessionals.
- Evaluation of Texture: Texture analysis can be used to determine whether soybeans are tender, firm, or hard. This should be possible utilizing particular hardware that actions the power expected to pack or break the soybeans. Soybeans' suitability for particular processing methods or products can be determined through textureanalysis.
- Test of Taste: Tasting soybeans to determine their flavor profile may be part of the sensory evaluation process. Prepared specialists can assess the taste credits like pleasantness, harshness, umami, or any off-flavors. Taste testing can assist with recognizing any flavor deformities or varieties in various soybean tests.

** It is essential to keep in mind that the specific tests that are carried out on soybeans may differ depending on the intended application and industry standards. These tests are typically carried out by professional food scientists, sensory analysts, or agricultural experts to guarantee the consistency and quality of soybean products.

II. Raw Potatoes:

- Visual examination: The potato's skin should be examined for any indications of decay, mold, discoloration, or damage. New, solid potatoes ought to have a smooth surface and a uniform surface.
- Evaluationof texture: To determinewhetherthepotatoisfirm,gentlysqueezeit. A good raw potato should not have any soft spots or sponginess to it. It should feel solid and firm. Additionally, the skin should not be wrinkled and betaut.

- Analyses of taste: Although you shouldn't eat raw potatoes because of their starchy and slightly bitter taste, you can still taste them by cutting a small piece off and tasting it. Keep in mind that raw potatoes contain enzymes that, when consumedinlargequantities,canbeslightlyharmful;therefore,keepyoursample size small and exercisecaution.

- Taste test: The aroma of raw potatoes should be mild and earthy. Assuming you notice any foul or sharp smell, it could show waste.

- Evaluation of sprouting: Analyze the potato for any fledglings or greenish staining. Although sprouting does not render the potato unpalatable, it may alter its flavor and texture. Moreover, green regions contain a compound called solanine, which can be harmful in enormous sums. Discard the potato if it has a lot of sprouting or a lot of green unit.

Quality Testing of Final products

1. **Estimation of MoistureContent:**

Equipment required: Hot Air Oven

Methodology:

- The weight of the empty petri-plate is takenaccurately.
- A small sample of (3-5 grams) is weighed and taken in the petriplates
- It is heated at 105°C in the hot air oven for 3-4 hours.
- Thepetri-platewiththesampleiscooledtoroomtemperatureinadesiccator.
- The final weight of the petri-plate containing the flour sample isnoted.
- Moisture content is calculated asfollows: [(M1 – M2)) / (M1 – M)] x100
  Where, M1 = weight of petri plate + weight of sample before drying. M2=weightofpetriplate+weightofsampleafterdrying. M = weight of empty petri- plate

2. **Estimation of Total Soluble Solids: TSS in soup slurry**

Equipment required: Brixmeter

Methodology:

- Small quantity of the sample, is taken on the fixed prism of Brixmeter and immediately the movable prism is adjusted. Suitably the field of view is adjusted.
- The line dividing the dark and light parts of the surface are brought in the field of view to the crossing of the threads and the value of the brix isread

1. **Protein Content:**
   - AccordingtotheFSSAIguidelines,ProteinContentofOkaraPowder,must be above 25%, and for our sample, we found it to be 29.53%, which can be considered acceptable.

2. **Water Solubility Index:**
   - According to FSSAI guidelines, Water Solubility Index, of Potato Powder, must be within 4.45%-8.3%, and for our sample, we found it to be 7.75%, and therefore, we can consider it to be within therange.

3. **Mineral Content:**
   - According to FSSAI guidelines, the Mineral Content of Okara Powder, should be around 1.5%, but for our sample, we got it to be around 0.327%, which is well below the acceptable range.

4. **Crude Fiber Content:**
   - According to FSSAI guidelines, the Crude Mineral Content of Okara Powder, should be around 55%, but for our sample, we got it to be 42.48%, which is slightly below the acceptablerange.

5. **Fat Content:**
   - According to FSSAIguidelines,theFatContentofOkaraPowder,shouldbe below 10%, and for our sample, we found it to 8.3%, which is within the range and thereforeacceptable.

3. RESULT AND DISCUSSION

➢ RESULT:

Table1: Table of the Quality Analysis Results of the samples

SL.NO.	*NAME OF TEST*	*SAMPLE*	*RESULT*	*INFERENCE*
1.	Moisture content	Okara powder	7.54%	Within the range
2.	Moisture content	Potato powder	6.94%	Within the range
3.	Moisture content	Soup pre-mix	5.66%	Above the range
4.	Total soluble solids	Soup pre-mix	4°	Within the range
5.	Total soluble solids	Potato powder	1°	Within the range
6.	Protein content	Okara powder	29.53%	Within the range
7.	Water solubility index	Potato powder	7.75%	Within th range
8.	Mineral content	Okara powder	0.327%	Below the range
9.	Crude fiber content	Okara powder	42.48%	Slightly below the range
10.	Fat content	Okara powder	8.3%	Within the range

➢ DISCUSSION:

6. Moisture Content:

- According to FSSAI guidelines, Moisture Content of Okara Powder, should be less than 8%, and for our sample, we found it to be 7.54%, which is acceptable.
- According to FSSAI guidelines, Moisture Content of Potato Powder, should notbe7%,andforoursample,wefounditto be6.94 %,whichisacceptable.
- According to the FSSAI guidelines, Moisture Content of Soup Pre-mix, should be less than 5%, but for our sample, we found it to be 5.66%, which is slightly above the mentioned acceptable range.

7. Total Soluble Solids:

- According to the FSSAI guidelines, Total Soluble Solids of Soup pre-mix, must be below 5º, and in our sample, we found it to be 4º. Hence, we can consider it to be within the acceptable range.
- According to the FSSAI guidelines, Total Soluble Solids of potato powder, must be below 6º, and in our sample, we found it to be 1º. Hence, we can consider it to be within the acceptable range.

8. Protein Content:

- AccordingtotheFSSAIguidelines,ProteinContentofOkaraPowder,must be above 25%, and for our sample, we found it to be 29.53%, which can be considered acceptable.

9. Water Solubility Index:

- According to FSSAI guidelines, Water Solubility Index, of Potato Powder, must be within 4.45%-8.3%, and for our sample, we found it to be 7.75%, and therefore, we can consider it to be within therange.

10. Mineral Content:

- According to FSSAI guidelines, the Mineral Content of Okara Powder, should be around 1.5%, but for our sample, we got it to be around 0.327%, which is well below the acceptable range.

2. Crude Fiber Content:

- According to FSSAI guidelines, the Crude Mineral Content of Okara Powder, should be around 55%, but for our sample, we got it to be 42.48%, which is slightly below the acceptablerange.

3. Fat Content:

- AccordingtoFSSAIguidelines,theFatContentof OkaraPowdershouldbe below 10%, and for our sample, we found it to 8.3%, which is within the range and thereforeacceptable.

- ***HEADONIC SCALE:**(On a scale of 0-9)*

1. FOR SAMPLE 1 - POTATO POWDER + SPICE MIX(CONTROL):

Table 2: Headonic Scale for Sample 1

SL. NO.	*HEADCOUNT*	*APPEA-RANCE*	*AROMA*	*TASTE*	*FLAV-OUR*	*TEX-TURE*	*MOUTH-FEEL*	*AFTER-TASTE*	*OVER-ALL*
1	Person 1	8	8	9	9	8	7.5	8	8.5
2	Person 2	9	9	9	9	8	8	8.5	9
3	Person 3	8	8.5	8	9	8.5	8	9	8.5
4	Person 4	8.5	9	8	8	8	8	8	8
5	Person 5	7.5	8	9	8	7.5	8.5	8.5	8
6	Person 6	8	8.5	9	8.5	8	7.5	8	8.5

2. FORSAMPLE2-POTATOPOWDER+2%OKARAPOWDER+SPICEMIX:

Table 3: Headonic Scale for Sample 2

SL. NO.	*HEADCOUNT*	*APPEA-RANCE*	*AROMA*	*TASTE*	*FLAV-OUR*	*TEX-TURE*	*MOUTH-FEEL*	*AFTER-TASTE*	*OVER-ALL*
1	Person 1	7.5	7	8	8	7	7	6.5	7
2	Person 2	7	8	7	7.5	7	7	6.5	7
3	Person 3	7.5	7.5	6.5	7	7.5	6.5	7	7
4	Person 4	8	7.5	7.5	7	6.5	6	7.5	7.5
5	Person 5	8	8	7	7.5	7.5	7	7	7
6	Person 6	7	8	7.5	7.5	6.5	6.5	6.5	6.5

3. **FORSAMPLE4-POTATOPOWDER+8%OKARAPOWDER+SPICEMIX:**

Table 5: Headonic Scale for Sample 4

SL. NO.	*HEADCOUNT*	*APPEA-RANCE*	*AROMA*	*TASTE*	*FLAV-OUR*	*TEX-TURE*	*MOUTH-FEEL*	*AFTER-TASTE*	*OVER-ALL*
1	Person 1	6.5	6	6	6	6.5	6	5.5	6
2	Person 2	7	6.5	5.5	6.5	6	5.5	5	5.5
3	Person 3	6	5.5	5	5.5	5.5	5.5	5	5.5
4	Person 4	6	7	6	5.5	6	6	5.5	6
5	Person 5	5.5	6	6	6.5	6	6	5	6
6	Person 6	6.5	5.5	5.5	96	5.5	6	5	5.5

4. FORSAMPLE4-POTATOPOWDER+8%OKARAPOWDER+SPICEMIX:

Table 5: Headonic Scale for Sample 4

SL. NO.	*HEADCOUNT*	*APPEA-RANCE*	*AROMA*	*TASTE*	*FLAV-OUR*	*TEX-TURE*	*MOUTH-FEEL*	*AFTER-TASTE*	*OVER-ALL*
1	Person 1	5	5.5	4.5	4	5	4	3	4
2	Person 2	5.5	5.5	4.5	4	5	4.5	3.5	4.5
3	Person 3	5.5	5	4	4	4.5	4	3.5	4.5
4	Person 4	4.5	5.5	4	4	4.5	4.5	4	4
5	Person 5	5	5.5	3.5	3.5	4	3.5	3	3.5
6	Person 6	4.5	5	4	3.5	4.5	4	3.5	4

The results of the sensory evaluations of all the four soup premix samples dissolved in hot water, with no Okarapowder,2%Okarapowder,4%Okarapowderand8%Okarapowder,in the tables 2, 3, 4 and 5 respectively, are shown above.

The overall acceptability of the samples with higher okara content, is comparatively less than that of the samples with lesser or no amount of okara powder.

Theacceptabilityofthesampleswith2%andnookarapowder,werefoundtobequitehigher, and people even tend to have a more positive response towards it, as depicted in the hedonic scale. They dissolved uniformly in the water, did not leave any residue, had a good palatable taste, a flavorful aroma and goodaftertaste.

On the contrary, the acceptability of the samples with higher okara content, were on the negative bend. The presence of higher amounts of the okara powder, caused a kind of a bitter taste in the soup causing it to be less palatable among the people. Moreover, the ones with higher amounts of okara powder, did not quite dissolve fully. The addition of okara powder, seemed to leave a residue, when mixed in hot water thoroughly. The texture, was not satisfactory as well, and the okara powder granules, left a gritty or sandy mouthfeel.

Hence, we can conclude, if we leave the control sample aside, the sample with the 2% okara powder addition, was found to be more accepted, among the general public.

Fig. 11: The four different samples of the soup Pre-mix, dissolved in hot water (1- No okara powder, 2- 2% okara powder, 3- 4% okara powder, 4- 8% okara Powder)

HAZARD ANALYSIS AND CRITICAL CONTROL POINT(HACCP)

AmethodicalapproachknownasHazardAnalysisCritical ControlPoint(HACCP)isusedto identify and control potential threats to food safety in food productionprocesses.

- Conduct a risk assessment: Here, we need to find any potential dangers in our soup premix. Microbiologicalrisks (likebacteriaorpathogens), chemicalrisks (likeallergens like soy or contaminants), or physical risks (like foreign objects like stones, bean coverings, seeds, and peels) are all examples ofhazards.
- Identify key control points (CCPs): Determine the essential production processes or steps necessary to control the identified hazards. CCPs may include potatopreparation, protein addition, cooking, cooling, packaging, and storage for our souppremix.
- Set important limits: Set quantifiable standards for each recognized CCP to guarantee thatthecycleistakencareof.Time,temperature,pH,thelevelofmoisture, oranyother relevant parameter could all play a role in these limits. Model we might lay out a basic breaking point for cooking temperature to guarantee the obliteration of destructive microbes.
- Screen CCPs: Routinely screen and record the distinguished basic control focuses to confirm that they are inside the laid out limits. Temperature checks, visual inspections, or testing for microbial or chemical contamination are all examples ofthis.
- Lay out restorative activities: Characterize the moves to be made in the event that a deviationfromabasicbreakingpointhappens.Thisincorporatesrecognizingthemoves toward manage the cycle back and to forestall the arrival of danger ousters.
- Confirmation:TheHACCPplanshouldbeevaluatedand validate regular basisto ensure that it works. This might entail carrying out internal audits, evaluating sample products, or seeking verification from a third-party.
- Documentation: Keep up with exhaustive documentation of your HACCP plan, including risk investigation, CCPs, basic cutoff points, observing records, remedial activities, and check exercises. Compliance, audits, continuous improvement, and research and development for future scope all depend on this documentation.

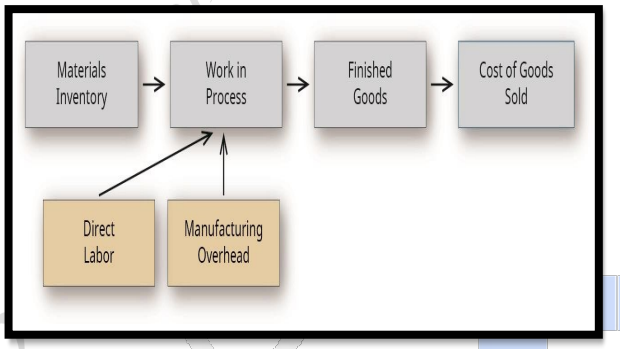
COST ANALYSIS

A more in-depth evaluation of the direct and indirect costs that influence the final price of a productorserviceisknownascostanalysis,anditisamoreinvolvedprocess.Afteremploying either of these strategies and identifying costs, it may be necessary to negotiate for the best price.
A method for weighing a decision as objectively as possible is a cost-benefit analysis. It involvesaddinguptheadvantagesofaproject,investment,orcourseofactionandcontrasting theadvantageswiththeircosts.
Ifyou'veevertakenapieceofpaperanddrawnalinedown the middle, listing the benefits of a proposed action on one side and the drawbacks on the other, you've already done a cost-benefit analysis in its most basicform.

When it comes to making business decisions, one can use the method to look at a wide range of things:

- to determine whether a capital expenditure isworthwhile.
- To determine whether to employ new workers.
- To determine the viability of a project or operational change.

- To foster a benchmark for contrasting tasks.
- To compare and contrast various marketing initiatives.
- To determine whether a proposed policy is desirable.
- Prioritize investments so that you concentrate on the first actions that yield the most value.
- To quantify how stakeholders would be affected by a change initiative.
- To set objectives for the project itself, such as time, productivity, or cost constraints for a project you've reviewed and approved



The following table shows a detailed break-up of the estimated cost a: Tabl6: Cost Analysis

SL.NO.	MATERIAL	QUANTITY USED	PRICE
1.	Potato	500 gm	₹20/-
2.	Soybean	250 gm	₹30/-
3.	Lemon	2 pcs.	₹10/-
4.	Spice mix	100 gm	₹40/-
5.	Overhead cost	Nil	₹500/-

PACKAGING

Bundling for a potato-based protein-improved soup premix can change contingent upon the brand and market inclinations. However, there are some common packaging options and general considerations for our product:

- Components: In order to guarantee the product's freshness, the material used in the packaging should be suitable for food products and provide an effective barrier against oxygen, light, and moisture.Laminatefilms, pouches, or cartonsmadeofpolyethylene, polypropylene, or paperboard are commonchoices.

- Graphics and design: The design of the packaging should convey the product's nature andbeappealingtotheeye.Tomakeiteasierforcustomerstocomprehendtheproduct at a glance, it can include pictures of potatoes, protein sources, or a bowl of soup. Include the product's name, brand logo, nutritional information, and cooking instructions, all of which should be clear and concise.

- Control of Portion Size: Depending on the target market, we can offer the premix in single-serving packets or multi-serving containers. Individual sachets with a single portion offer convenience and portion control, while larger containers (based on a 40- gram basis) may be appropriate for families or foodservice establishments and can accommodate two people.

- Seal ability: To keep the product's integrity and prevent air or moisture from entering, thepackagingshouldhaveasecureanddependableseal. Tear strips, Zip pouches, and heat-sealed edges are all common choices.

- Labelling: Ensure that the nutritional information, ingredient list, declarations of allergens, and any certifications(suchasorganicorgluten-

free)onfoodlabelsareallin compliance with the relevant regulations. For easy reading, use fonts that are clear and easy to read. Because potato has a lot of carbohydrates and okara has a lot of protein, this can be mentioned on the label to get people to buy it. • Storage and Shelf Life:The product ought to be safeguarded during transportation, handling, and storage by the packaging. To extend the soup premix's shelf life, think about including features like oxygen absorbers, barrier materials, or airtight seals.

- Long-Term viability Eco-friendly packaging has received a lot of attention in recent years. To lessen the impact on the environment, think about using materials that canbe recycled, biodegraded, or made from renewable resources.

PRECAUTION

Precautions must be taken when working with soup premix in a laboratory to ensure safety and avoid contamination. Consider the following general security measures:

- EquipmentforProtectiveUse(PPE):PPE,suchas gloves,safetygoggles,andalabcoat or gown, should always be worn. Wearing PPE helps keep you safe from accidental chemical contact and splashes.

- Spotless and coordinated work area: Keep a clean and mess free work area. Get rid of anything that won't help you do your job or could cause contamination.

- Compatibility with chemicals: Know how well the soup premix's components work together.

- Adequate labeling: Obviously mark all holders, cylinders, and vials used to store and dealwiththesouppremix.Includethena meofthe premix, the dateofpreparation,and any pertinent safetyinstructions.

- Stay away from cross-contamination: To avoid cross-contamination, use separate equipment, containers, and utensils for each type of soup premix. Clean and disinfect gear when eachutilization.

- Exact estimations: Utilize calibrated equipment, such as weighing scales or volumetric tools, to ensure that the ingredients are accurately measured. This keeps up with consistency and exactness in the souppremix.

- Safe taking care of and stockpiling: Follow appropriate dealing with methodology for the soup premix, including lifting and conveying holders with care to forestall spills or breakage. The premix should be kept out of direct sunlight, heat, and moisture in appropriatecontainers.

- Methods for an emergency: Learn about the lab's emergency procedures, including wheretofindfireextinguishers,emerge ncyexits,eyewashstations, andsafety showers. Prepare to respond quickly to spills oraccidents.

TROUBLESHOOTING

- Fostering a potato-based protein-improved soup premix can have introduced a few difficulties. The following are some typical issues that may arise during this procedure:

- Source of Protein: Finding the Right Protein: Finding a reasonable protein source to improve the soup premix can challenge. While potatoes themselves contain some protein, it may not be adequate to meet the ideal protein content. It can be difficult to select a protein source that complements the potato base, improves the nutritional profile, and meets sensoryrequirements.

- Protein Retention and Stability: Keeping up with protein soundness all through the assemblingsystemandcapacityisurgent.Protein scanbedelicateto intensity, pH,and other handling conditions, which can influence their usefulness and dietary benefit. Formulationandhandlingmustbehandledwithca retoensurethattheproteindoesnot degrade during processing, packaging, orstorage.

- Surface and Mouthfeel: Potatoes are renowned for their creamy, smooth texture. The addition of protein to the soup premix may result in a product that is grainy or gritty in texture and flavor. Emulsifiers, stabilizers, or texturizing agents may be necessary to achieve the desired texture that is both smooth andprotein-rich.

- Taste and Flavor: Potatoes taste gentle that can be effortlessly overwhelmed. The soup premix'soverallflavorprofilemaybealteredbyin cludingproteinsourceswithdistinct flavors. Adjusting the flavors and guaranteeing that the protein expansion doesn't think twice about wanted taste can be a criticaltest.

- Balance of nutrition and formulation: Fostering an even detailing that meets the ideal dietary profile can be complicated. Accomplishing the ideal protein content while additionally considering other macronutrients, like starches and fats, as well as fundamental micronutrients, requires cautious thought. Adjusting these components while keeping up with great taste and surface is a urgenttest.

- Shopper Acknowledgment: Consumer acceptance of a potato-based protein-enriched soup premix may be a challenge. Potatoes are frequently portrayed as a source of carbohydrates rather than protein. It can be difficult to persuade customers of the nutritional benefits and gain their acceptance for a new productcategory.

- Prices and Purchasing: It can be hard to find protein sources for the soup premix that arebothaffordableandlong-lasting.Theoverallviabilityandscalabilityofthep roduct are affected by the cost or availability of some protein sources. Guaranteeing a dependable and predictable production network for the picked protein source is fundamental.

A potato-based protein-enriched soup premix that meets nutritional requirements, taste preferences, and consumer expectations must be developed through careful research, formulation development, and iterative testing in order to overcome these obstacles.

Wedecidedtodoourprojectonsomethingrelatedwith drypowdersonly.Webothresearched a bit and thought of doing it with soybeans only as it was our base or major ingredient. We could easily extract the okara from the beans but from that soymilk we couldn't extract tofu. So we thought of doing potato-based protein-enriched soup premix. Potato is a staple food in India which is rich in carbohydrates but lacks in protein. So to make something beneficial for our society we thought of fortifying it with okara which is rich in protein source. We made powders of both and mixed them with spicecondiments.

In 40g soup premix we did 4 samples of each and changed the okara content to 5,10,15 and onecontrol.Okarausuallyhasabad smell, but steaming from autoclave for5-7minutes. It was reduced to some extent.

The content was quite high so it settled down easily so we changed it to 4, 8 respectively,

We also did foam mat drying for both the powders but finally we got our product which was quite tough job. After several like 5 to 6 trials we got our desired product. It was quite tasty being made in lab

5. FUTURE SCOPE

There are a number of reasons why potato-based protein-enriched soup premix has a lot of potential for the future. Opportunities and potential growth areas include:

- Growing Demand for Proteins Made from Plants: There is an increasing demand for protein sources that are derived from plants as people become more concerned about their health and the environment. Potato-based protein-improved soup premixes can take care of this interest by giving a helpful and nutritious plant-based choice, subsequently an option in contrast to creature based protein sources.

- Accommodation and Efficient: Convenience plays a crucial role in food choices in today's fast-paced lifestyle. These soup premixes offer a fast and simple answer for occupiedpeoplewhoneedanutritiousfeastwith outinvestingalotofenergyinplanning as it is healthy and protein rich dinner choice.

- Benefits for the diet: Vitamins, minerals, and dietary fiber are all good sources of essential nutrients found in potatoes. It is possible to increase the nutritional value of potato-based soup premixes and attract health-conscious consumers by including protein.

- Customization and Development: A wide range of potato-based protein-enriched soup premixes are available for manufacturers to experiment with in terms of flavors, components, and formulations. This lets you customize and come up with new ways to meet different people's dietary needs, like gluten-free, vegan, and low-sodium options.

- Growth of the Market: Protein-rich soup premixes made with potatoes can be sold to a wide range of customers, including health food stores, supermarkets, online retailers, andevenrestaurantsand other. By extendingdissemination channelsandbringingissuesto light, the itemcanarriveatamoreextensive buyer base.

- Innovative work: Potato-based protein-

enriched soup premixes may seeadvancements as a result of ongoing research and development efforts. Enhancing flavor, texture, and nutritionalvaluecan,ascandevelopingnovelpackagingoptionswith a longer shelf life.

6. CONCLUSION

Despite the numerous benefits of potato-based protein-enriched soup premixes, it is essential totakeindividualdietaryrequirementsandpreferencesintoconsideration.Thosewithexplicit dietary limitations or sensitivities ought to painstakingly survey the fixing rundown to guarantee similarity.

In addition, it is always recommended to eat a variety of foods from various food groups to keep a balanced diet. They are free of cholesterol, low in saturated fat, and high in essential amino acids, all of which are beneficial to one's health.

Because potatoes are a versatile and widely consumed vegetable, they can be easily incorporated intosouppremixes.Theygive a decent wellspringofstarchesforenergyandare low in fat, making them reasonable for different dietary inclinations. Also, potatoes contain fundamental supplements like L-ascorbic acid, potassium, and nutrients.

The consideration of protein in potato-based soup premixes improves their healthy benefits. Potatoes are a common staple food that are also high in carbohydrates but low in protein. As aresult, we —knownasokara—fromsoybeans,drying in-trays at60°C, andthengrindingitintopowder.Thesamemethodisalsobeingusedtomakepotatopowder. Then, at that point,wearesustainingthepotatopowderwithokarapowderandgettingpotato based protein advanced soup premix. This is a healthy alternative that will help you get rid of cholesterol and other problems with our health.

In India a huge amount of potato is produced as well as also in West Bengal. In West Bengal inmanydistrictspotatoiscultivatedbutduetoinadequate processingtechnology,inadequate preservation only about 0.5% potato is processed where many type of potato is available that is suitable for processing among of them one is KufriChandramukhi which has readily cultivated in West Bengal as well as inIndia.

The present study has focus on the preservation of potato as potato powder which can also be export out of India. The study has also focus on the food product development from the dried powder of potato which can be helpful to processing industries of large and smaller scale.

There is a huge potential for processed potato products such as potato flakes, potato powder, frozen potatoes, frozen French fries, potato chips/wafers are one of the most popular snack items consumed throughout world. It is with 85 per cent of the total market share. India is one of the largest snack markets in the Asia- Pacific region contributing three per cent to the total Asia-Pacific snack market share.

There is a huge potential for processed potato products such as potato chips, wafers,
potato flakes, potato powder, frozen potatoes, and frozen French Fries etc. in India. To meet the burgeoning demand, potato processing is emerging as a fastest growing industry with the entry of numbers private players.

The results of the study will be useful for policy makers, farmers and input agencies involved in promotion of potato cultivation, preservation and processing in developing strategies to boosttheproduction,,and boost up the Indian economy as well.

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