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RESEARCH ARTICLE

Development and quality evaluation of ragi based protein rich nutritious Ambil

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ABSTRACT

Ambil is a naturally occurring lactic fermented beverage made from cereal that is popular in Maharashtra, Southern India (known as "Ambil") and North-Western India. It is a utilization of millet and buttermilk to formulate a value-added health beverage. The market for protein rich foods is anticipated to expand quickly between 2018 - 2025. whey protein concentrate (WPC) contains 80% protein. Raw whey protein has a flavor that is grassy, beany, and chalky; all of which have an impact on its quality, the products made from it, and the market's consumer acceptance. The present research work focuses on enhancing the protein abundant nature. Protein rich ragi ambil made by using particle size 100 mesh for malted ragi flour cooked at 80 ℃, 12min and was then cooled to room temperature and Based on the organoleptic assessment, the formulation having 10g of WPC, 7g of SP (Spirulina protein) 10g of MRF (Malted ragi flour), 2g of kenaf leaves powder, Physicochemical properties the protein content of ragi amble was found to be 11.6%. The protein rich ragi ambil packaged in the glass bottle kept at room temperature was acceptable over a period of 45 days. The prepared ragi ambil will find its potential application in cancer patient treatment, overcome malnutrition, can be included in diet and sport supplement as a high protein source.

Keywords: Ambil, nutrition, spirulina, ragi, whey protein

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INTRODUCTION

In the current world, there is a rising demand for dietary supplements and energy boosters. For both adults and adolescents, nutritional beverages give nourishment and energy. Health drinks are typically eaten instead of milk by growing children and are typically touted as being nutritious. On the other hand, energy drinks are a type of product that make the promise to increase both mental and physical energy. Energy drinks are readily available on the market nowadays in a wide variety of brands and flavours. Energy drinks have gotten into the daily lives of adolescent and adult consumers in recent decades1. credited with heightening. These beverages are widely available in university campuses, clubs, and recreational facilities to improve energy or mental acuity (Jacob et al., 2013).

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Since 1996, the global beverage market has grown by 31% in terms overall revenue and 26% in terms of volume, while modern living standards and consumer education have led to a higher intake of foods with nutritional and functional value. Additionally, foods with lower fat content rose in popularity. Today, cutting-edge technologies, their application, and their development are concentrated on the manufacturing of food items based on dairy raw materials that are high in protein and carbohydrates, such as whey, skim milk, or buttermilk. (Meshram, 2015), this is the foundation and top focus for restaurants and food sector businesses in the contemporary setting. Production of various milk beverages is a concept for goods based on the amino acids and sugars found in dairy raw materials.

MATERIALS AND METHODS

Collection of raw material

The local market was visited to acquire ragi grains, buttermilk, salt, cumin powder, and garlic. Kenaf leaves were bought from a dependable supplier. To make malt ragi flour, ragi was germinated/Sprouted, dried, and milled (Chilkawar et al., 2010). Garlic, Corriander leaves and kenaf leaves were dried appropriately before being substituted into powder (Chandramouli et al., 2012). Spirulina powder, whey protein concentration powder, xanthan gum, and other spices and condiments were obtained from local Kolhapur markets and e-commerce retailers quality parameters.

Moisture content (MC)

The Moisture content **(**MC) was measured using the oven drying method. Known wt. of each material's sample was kept in an empty petri - dish, pre-weighed, and to remove moisture in an oven at 105℃ until a steady weight was reached (6 -7 hrs) (Ranganna, 1986).

Ash content

To determine ash content sample was drawn into pre- weighed crucible which was further completely charred by heating it on low flame, cooled and situated in muffle furnace, ignited for about4 hours at 550 °C (A.O.A.C., 1990).

Fat content

Fat content of product was analyzed by Soxhlet method. Fat was calculated with the help of AOAC method (A.O.A.C., 1900).

Protein content

Percentage of protein in Product were calculated with the help of kjeldahl method. This method was divided into 3 steps. For Digestion step, weighted of 2 gm of sample. Add sample into test tube with reagent powder (Potassium Sulphate & Copper sulphate) and 10 ml conc. H_2So_4. Then put it on hot Plate for digestion at 300℃- 400℃ for 4 to 5hrs. After cooling add some amount of distilled water into the test tube. Final point of digestion was recorded when sample colour turned into greenish or bluish. Second step was Distillation. Steam Distillation was carried out with the help of addition of acid & alkali in Distillation tube. Boric acid & 45% NaoH (sodium Hydroxide) was usedto rising the pH. In this method, Ammonium (NH_4^+) ions was changed to Ammonia (NH_3), which is gas. Titration of collected solution was done in flask with the help of 0.1 N H_2So_4. At the end of titration process, blue colour of solution is turns into Pink (A.O.A.C., 1990). Protein will be finding by using given formula 6.25 × N.

Total carbohydrate content

Percentage of Carbohydrates = 100 - (percentage of moisture+ Percentage of Ash + Percentage of Protein + Percentage of Crude fat) (Suman 2008)

Crude fiber

Acid and Alkali wash method was used to analyses the Crude fiber percentage in product as per method given in A.O.A.C. (1990).

Preparation of Ragi malt flour

Ragi was germinated and then dried to prepare malted ragi. Then it was milled to obtain flour of specific particle size. Following process flow chart was used with slight modification. In order to prepare ragi malt, first weigh the finger millet. Once cleaned, steep it in water for eight hours to soak it. During this process, change the water every four hours after draining any excess water. Spread ragi seeds on muslin cloth-lined trays with perforations. The germination process now begins and lasts for about eight hours. After that, leave it in the tray drier for four hours at 65 ˚C to finish drying After grinding and sieving, we obtain malted ragi flour (Table 1).

Formation of Ambil

Ragi Ambil was formed using the process where Whey protein and spirulina protein are combined together with KLP (kenaf leaves powder) for its distinct sour flavor and nutritional properties. at various optimization levels, to make a protein-rich, healthful ambil. The procedures that were followed in order to produce high-quality ambil were as follows: first, the raw materials were weighed; next, malted ragi flour and water were added to form a slurry; the mixture was then cooked for five minutes; next, KLP was added; stirred constantly; finally, WPC and SP were added; finally, the mixture was allowed to cool.

Optimization of whey protein powder and spirulina in protein rich Ambil

The consistency and drinking ability of the ragi-based protein-rich spirulina and WPC-added healthy and nutritious Ambil were chosen based on the consistency parameter, using ragi flour was 10gm, KLP was 2gm, Salt was 2gm and water was 400ml are kept constant. In sample S1, WPC & Spirulina was 20gm & 5gm respectively. In sample S2, WPC & Spirulina was 18gm & 7gm respectively, in sample S3, WPC & Spirulina was 16gm & 9gm respectively.

Table 1: Formulation for Optimization of Spirulina protein in ragi based protein rich healthy and nutritious Ambil

Sample Code	MRF (gm)	KLP (gm)	WPC (gm)	Spirulina (gm)	Salt	Water (gm)
S1	10	2	20	5	2	400
S2	10	2	18	7	2	400
S3	10	2	16	9	2	400

RESULTS AND DISCUSSION

Sensory evaluation based in Ragi protein rich (WPC) (Spirulina) Ambil with added kenaf leaves powder

By above Tactile progress sample V2 is selected

S1 = 10-gram MRF, 5 gm spirulina, 20-gram WPC, 2gm kenaf powder, 400 ml water, 800c, time 11-minute, mesh 100

S2 = 10-gram MRF, 7 gm spirulina,18-gram WPC, 2gm kenaf powder 400 ml water, Temp 80^0c, time 11-minute, mesh 100

S3 = 10-gram MRF, 9 gm spirulina, 16-gram WPC, 2gm kenaf powder 400 ml water, Temp 80^0c, time 11-minute, mesh 100

The consistency and drinking ability of the ragi-based protein-rich (spirulina and WPC) healthy and nutritious Ambil were chosen based on the consistency parameter, using MRF (10), WPC (20, 18, 16), And Spirulina (5, 7, 9 gm) KLP, and constant water (Table 2).

Table 2: Sensory evaluation based in Ragi protein rich (WPC) (Spirulina) Ambil with added kenaf leaves powder.

Attribute	Sensory Score		
	S1	S2	S3
Color	8	9	8
Consistency	7	8	8
Taste	9	8	6
Flavor	6	8	7
Mouth feel	7	7	8
Overall Acceptability	7.4	8	7.4

We selected sample S2. The taste is diluted by the addition of; thus, salt and sourness must be added.

The final choices about texture, acceptability overall, and nice aroma have been made based on sensory evaluation

Chemical parameters of control sample and final product

The Ragi-based protein-rich Ambil boasts a nutritional profile that underscores its status as a healthy and nourishing beverage option. With a total solid content of 9.01 ± 0.07%, it offers a balanced combination of essential nutrients. Its protein content of 11.03 ± 0.01% makes it a notable source of this vital macronutrient, while its moderate fat content of 4.5 ± 0.01% contributes to its nutritional richness. The presence of ash at 1.2 ± 0.009% suggests the inclusion of mineral elements, further enhancing its nutritional value. Additionally, the Ambil contains a modest amount of crude fiber at 0.58 ± 0.18%, supporting digestive health. Its carbohydrate content stands at 83.6%, providing a substantial source of energy. Furthermore, the Ambil offers 54.27 mg of calcium, contributing to bone health. With an acidity level of 0.0883 and a pH of 5.9, it delivers a tangy taste profile. Overall, this Ragi-based Ambil represents a wholesome and flavourful option for those seeking a nutrient-dense beverage (Table 3).

Table 3: Chemical parameters of control sample and final product

Parameter	Ragi based protein rich healthy and nutritious Ambil
Total solid	9.01 ± 0.07
Protein (%)	11.03 ±0.01
Fat (%)	4.5 ± 0.01
Ash (%)	1.2 ± 0.009
Crude fiber (%)	0.58 ± 0.18
Total Carbohydrate (%)	83.6
Calcium(mg)	54.27
Acidity	0.0883
pH	5.9

Effect of Storage study on microbial analysis of protein rich Ambil

TPC was 4×10^1 on first 15 days spent storing. At 45^{th} day that one was at 23×10^2 for protein rich Ambil. Microbial Load of yeast & Mold is absent at the 45th day of storage research, the item reported no Y&M count. After careful observation and data gathering for microbiological storage, we determine that the duration of shelf life will be up to 45 days the standard temperatures. With all approved final product quality parameters, protein rich Ambil will be suitable for aerobic storage in glass bottles for 45 days the standard temperatures (Table 4).

Table 4: Effect of Storage study on microbial analysis of protein rich Ambil

Storage Period (Days)	Parameters	
	TPC (cfu/g)	Yeast & Mold (cfu/g)
0	ND	ND
15	4×10^1	ND
30	55×10^1	ND
45	23×10^2	ND

Storage study effect on sensory attributes

The sensory study during storage was done for over 45 days at room temperature. Sensory study was done after reconstituting protein rich ragi Ambil. The Sensory study scores of the TSP during storage for days 45 mentioned in table 36. In general, utilizing sensory features qualities during storage period. Mean values initially reconstituted ragi based protein rich Ambil were 8.0– 8.1 which gradually decreased in day 45 to 7.81–8.0. Overall acceptance of developed protein rich ambil was good.

Table 5: Sensory attributes during storage

Days	Color	Appearance	Flavor	Taste	Consistency	Overall acceptability
0	8.4±0.12	8.6±0.18	8.3±0.26	8.5±0.22	8.1±0.11	8.34±0.24
15	8.1±0.17	8.7±0.15	8.2±0.18	8.5±0.20	7.8±0.17	8.24±0.17
30	8.2±0.21	8.3±0.32	8.2±0.27	8.1±0.17	7.7±0.34	8.06±0.18
45	8±0.28	7.9±0.24	7.9±0.12	8±0.11	7.5±0.15	7.81±0.15

CONCLUSION

Present examination was done to develop a Ragi based protein rich healthy and nutritious Ambil, additionally it also contains a lot of fiber, iron, and calcium. Malted Ragi flour was utilized as the real fixing. The flour of molecule size 60 mesh to 100 lattices were utilized. The practical features of the generated MRF revealed that it has great water ingestion limit and swelling power. For Protein rich ragi ambil we finalized given optimization where we used, 10 gm of malted ragi flour, 18 gm of Whey protein concentrate ,7gm of Spirulina protein powder, 2gm of kenaf powder, 2.0 gm of salt, was come about into most elevated tactile score. The selected ragi based protein rich healthy and nutritious Ambil (with added kenaf leaves powder) revealed that have high measure protein and calcium i.e., 11g and 54.27mg respectively. Hence the created item will be useful intended for those who needs a beverage rich in protein & calcium.

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