International Journal of Innovative Research in Technology, Science & Engineering (IJIRTSE)
ISSN: 2395-5619, Volume – 5, Issue – 2. March 2022

Formulation of Iron Rich Health Mix for Children, Pregnancy and Lactating Women

SathiyaPriyaR, Harikrishnan R, SreejithS, UrmilaH, Rajadurai
U.G.Student,DepartmentofFood Technology,Ramaiah UniversityofApplied Sciences,Bengaluru,Karnataka,India[1]

Assistant Professor, Department of Food Technology, Ramaiah University of Applied Sciences,

Bengaluru, Karnataka, India

Email address:rajadurai.ft.ls@msruas.ac.in

Abstract: In current era, anemia is a common public issue and the root cause for the same is lack of nutrients in the diet.Anemia has become a prominent health issue affecting right from new born babies, growing children and young ladies indeveloped as well as developing countries. The aim of this research is to formulate a RTS health mix with iron and reducedanti nutrient content for women and children and to analyze the physicochemical properties and proximate composition of thehealthmix**.**Therawmaterialswerecollectedandprocessedtobringthemintopowderedform.Thehealthmixwaspreparedbymixingall thepowdered rawmaterialsand finally includedthepalmcandysugarinpowderedformasasweetenertomakethehealth mix a Ready to Use product. For Organoleptic evaluation five-point Hedonic scale test used to find out the overallacceptability and scores were assigned for quality attributes like appearance, flavor, texture and taste and overall acceptability.Theoverallacceptabilityishighforvariation3.Itisconcludedthatthe variation3hashighscoresinallsensorycharacteristics and the overall acceptability was very good. It is evident that this new product can be feasible at pilot scalelevel. Hence it is possible to meet national and international export demand for Iron rich health mix. Further investigation isnecessary to study shelf lifeand economic aspectsoftheproductsbeforerecommendingforcommercialproduction.

Keywords:Healthmix formulation,Iron,Anemia,Antinutrient,Organolepticevaluation.

I. INTRODUCTION

A natural health mix is a natural food product composed of variety of cereals, pulses, nuts, herbs, andothernutritionrichingredients,whichresultsindevelopmentofhealthybodyprovidingessentialmacronutrients protein, fats and enriched fiber content whenthe health mix is consumed as a part of theregular diet by an individual [1]. The health mix formulation is carried out with perfect combination of varietyof grains and nuts making it best suited for consumers opting for healthy alternatives in their regular meal [2].A health mix is fed as food for babies to support weight gain and immunity boost. Value addition representsdegreeofinnovative changesmakingaproduct becomemore convenientfor consumers.

Value added processing means a method affecting the physical and chemical nature of food adding valuefor the commodity changing its indigenous state to value enriched state [3]. In India, children have been themost affecteddemographic of the undernourishedpopulation[4]. Nearlyeverythird child is consideredundernourished,withtheprevalencerateofunderweight,stunted,andwastedamongthechildrenunder5yearsho vering at 35.7%, 38.4%, and 21%, respectively, whereas every second child is anemic (58.4%; Governmentof India,2017). Food fortification, enrichment, preservation, food supplements etc. are some of the techniqueswhich should be adopted in order to promotethe idea of value addition of food production the food processingindustries.

Foodsupplementsareintenseformofalimentative(i.e.,mineralsandvitamins)orthesubstancesproviding nourishing or anatomical results that are commercialized in “dose” form (e.g., pills, tablets, capsules,liquids inlimited quantityofdoses).Abroadvariety ofhealth-givingnutrientsandothersupplementsmightbepresent in foods, which includes but does not limit the amino acids, essential fatty acids, fiber, and mineralssuch asiron, manganese, copper, iodine,zinc, andvitamins.

Iron has a crucial role participating in highly important activities such as oxygen transportation

Published By :
International Organization of Innovative Research and Publishers (IOIRP)
www.ioirp.com

throughhemoglobintoall othertissues inhumanbody. It also plays a major role incognitive andmotor development.Iron deficiency anemia is one of the global health problems. Anemia affects all age groups ie., infants,
children,adolescents,pregnantwomen,lactatingwomenandagedpeople.Adolescentgirlsarehighlyvulnerabletoanemia. Hence, ironsupplementationishighlyessentialtocombat anemia[5].

Use of supplements that contain iron was related to a significantly reduced prevalence of iron deficiencyamong women 19–50 y but not among other groups. Groups at highest risk of iron deficiency (e.g., low income andminority women) are often least likely to consume supplements containing iron, suggesting that supplement use isunrelated to actual need [6]. It has its significance in biotic role which includes cell proliferation, DNA synthesis,energy production, and respiration. There is a high requirement for iron in phases of pregnancy, child growth and aheavylossisfacedduringreproductionphaseofwomenmakingadolescentsvulnerableforirondeficiency.Habitualroutine of low iron containing foods and non-availability of iron provokes the condition peculiarly in vulnerablepopulation segment [7]. Iron supplementation reduces anemia and improves development, but its effects on infectiousmorbidityareconflicting.
Deficienciesofothervitaminsandmineralsalsoarecommonandshouldlimittheadvantagesof supplementalzincandiron.Thereissomeevidencethatsupplementationwithamicronutrientmix(MM)couldalsobemorebenefici althan supplementationwithonenutrientforafewoutcomes,e.g.,lineargrowth[8].

The comparative loss of iron due to inadequate diet makes it quite problematic for Indian women to fulfill ironrequirement particularly in pregnancy time. Pregnancy depletes the already stored iron to fulfill requirement of iron(approximately one gram) and restoring of depleted iron takes quite long duration. Iron supplements referred as "ironpills" are utilized for the purpose of anemia treatment which is a condition identified due to insufficient healthy redblood cell [9]. The present study, aimed to formulate the iron rich ready to serve health mix for children, pregnancy andlactatingwomen.

II. MATERIALSANDMETHODS

Experimental Location: Department of Food Technology, Faculty of Life and Allied Health Sciences, RamaiahUniversityof AppliedSciences, Bangalore.

ResearchMethodology:

Procurement of Raw Materials: The raw materials were selected based on the market survey of commerciallyavailablehealthmix,ironcontentoftherawmaterialandthefinalproductacceptabilityanalysis.Flaxseedisconsider ed as one of the key source of phytochemical and using of flaxseed in food products will be beneficial toprotecting against cancer and lowering cholesterol level, diabetes and heart disease [10]. The raw materials wereprocured from good quality wholesale suppliers from Tirupur (Tamil Nadu) during the month of September. The rawmaterialschosenforformulationofIron richhealth mixarepresented inthefollowingtableI.

TableI:RawMaterialsforRTSHealthMixwith NaturalIron

Sl.No.	NameoftheIngredient	Processing
1.	Flaxseed	Procuredinpackedform,roasted andground inhomescalemixer andsieved inhomescale sieve.
2.	Bengalgram	Procuredinpacked form,roasted andground inhomescalemixer andsieved inhomescale sieve
3.	Pearlmillet	Cleaned, washed, germinated, dried in tray drier, roasted, ground inhomescale mixer andsievedinhomescale sieve.
4.	Barnyard millet	Cleaned,washed,driedintraydrier,roasted,groundinhomescalemixer andsievedinhomescale sieve

Published By :
International Organization of Innovative Research and Publishers (IOIRP)
www.ioirp.com

5.	Horsegram	Cleaned, washed, germinated, dried in tray drier, roasted, ground inhomescale mixer andsievedinhomescale sieve
6.	Palmcandy sugar	Procuredinpacked formascrystalsandmilled topowderedform

Method of Preparation of Raw Materials: The procured raw materials (except Flaxseed and Bengal gram)were cleaned, washed, soaked, germinated, dried and dry roasted to remove the anti-nutrients. Each raw material waspre-processedindividually.FlaxseedandBengalgramweredryroastedseparatelyasthepre-processingstepandmilled to bring them into powdered form. After dry-roasting, all the raw materials were milled separately and stored inseparate zip-lock pouches to prevent them from getting affected by external environment. The health mix was preparedby mixing all the powdered raw materials and finally included the Palm candy sugar in powdered form as a sweetenerto make thehealth mixaReadytoUseproduct.

Proportions ChosenforDifferentVariations:TheHealth mixwas preparedinfivedifferentproportions tofind the best proportion among them and the Palm candy sugar was incorporatedasasweetenertobringa goodflavoredand highly acceptable Iron enriched health mix. The palmcandysugaralsocontributesintheenrichment ofIroncontentinthe healthmixand henceit plays amultipleroleinthehealth mix.The proportions chosenfordifferentvariationsof Health mixispresentedintable II.

TableII:DifferentVariationsofRTSHealth MixWithNaturalIron

RawMaterial	Variation1	Variation2	Variation3	Variation4	Variation5
Flaxseed	10 g	20 g	30 g	20 g	10 g
Bengalgram	30 g	40 g	20 g	10 g	30 g
Barnyardmillet	20 g	10 g	20 g	20 g	20 g
Pearlmillet	30 g	10 g	10 g	20 g	30 g
Horsegram	10 g	20 g	20 g	30 g	10 g

***Organoleptic Evaluation*:** Semi-trained panelists were selected to evaluate organoleptic properties.Both male and female panelists about 20 members with an age range from 20 to 30 years were recruited to testfor each variation. The proformance containing the questionnaire was prepared in English. The responses wererecorded on a 5-point Hedonic scale (1- very poor, 2- poor, 3- good 4- very good and 5-excellent) for color andappearance,consistency, flavor, taste and overall acceptability attributes. General demographic data (Name, age,sex anddateof evaluation) werecollected.

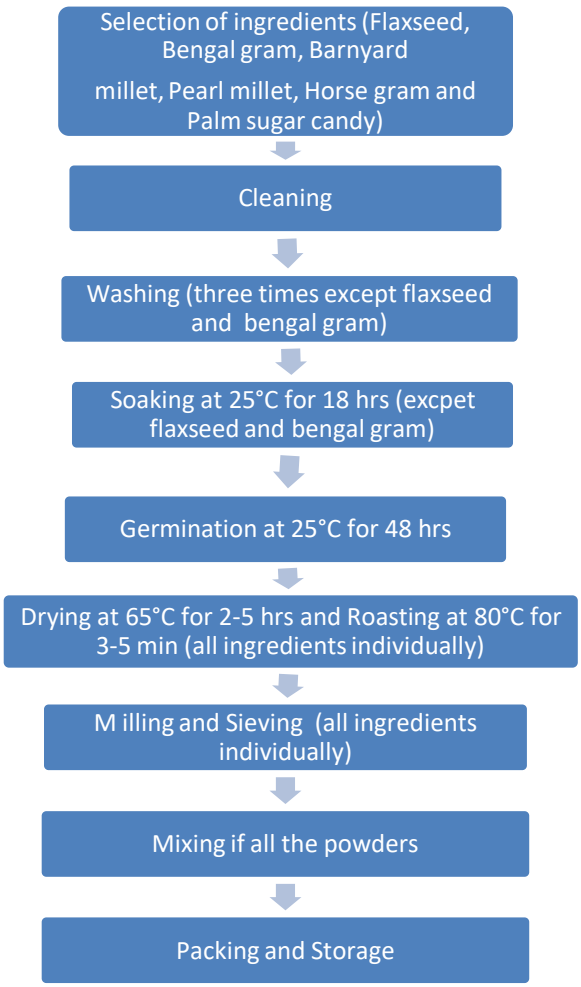
The formulated product of five different variations were boiled in hot water and cooked until it reacheda soup consistency. After cooking they were cooled down to mild heat temperature for effective results beforeperforming the organoleptic evaluation. The images of selected variations of Health mix are presented in thefollowing plates.

	**VARIATION3(POWDER)**

Published By :
International Organization of Innovative Research and Publishers (IOIRP)
www.ioirp.com

	**VARIATION3(LADDU)**
	**VARIATION3(PORRIDGE)**

Theoverallflowchartofformulatedproductispresentedas:



Published By :
International Organization of Innovative Research and Publishers (IOIRP)
www.ioirp.com

***Nutritional Analysis for Formulated Health Mix*:** Nutritional analysis was carried out to estimate thepresence of energy, carbohydrates, protein, fat, crude fiber, sugars, and iron in the finalized variation of theformulated Health mix. Antinutrient content tannin was estimated to find the percentage of tannin present in theformulatedhealthmix.

Statistical Analysis: The data was subjected to the statistical analysis. Descriptive statistics like meanstandard deviationandfrequencydistributionwere computed.

III. RESULTS ANDDISCUSSION

Theresultspertainingtothestudy"DevelopmentofRTShealthmixwithnaturalIron"arediscussedunderthefollowing headings.

TableIV: Mean ScoresofOrganolepticEvaluationsoftheRTSHealthMixWithnaturalIron

CRITERIA	V1 Mean± S.D	V2 Mean± S.D	V3 Mean± S.D	V4 Mean± S.D	V5 Mean± S.D
Color &Appearance	3.8 ±0.95	3.65±0.98	3.9 ±0.96	3.85±0.98	3.6 ±1.09
Consistency	3.5 ±0.82	3.45±0.99	3.6 ±0.88	3.8 ±0.61	3.2 ±0.76
Flavor	3.5 ±0.60	3.65±0.74	3.55±0.75	3.35±0.67	2.8 ±0.69
Taste	3.9 ±0.71	3.70±0.65	3.6 ±0.99	3.4 ±0.94	2.75±0.91
OverallAcceptability	3.65±0.67	3.55±0.82	3.7 ±0.73	3.6 ±0.68	2.9 ±0.75

***Organoleptic Evaluation*:** For Organoleptic evaluation five-point Hedonic scale test used to find out theoverall acceptability of each sample and test scores were assigned for quality attributes likeappearance, flavor, textureand taste and overall acceptability. In the hedonic scale method the stimuli (actual samples or food names) arepresented singly and are rated on a scale where the 9 categories range from "dislike extremely" to "like extremely"[11].The meanscoresoforganolepticevaluationoftheironrichhealthmixwereanalyzed.

***Overall Acceptability*:** The overall acceptability of Iron rich Health mix made with variation 1, variation 2,variation 3, variation 4, variation 5, scored 3.65, 3.55, 3.7, 3.6, 2.90, respectively. The overall acceptability is highforvariation3 andfinalized variation2 asithadhighscoresforitssensory characteristics.

***Nutrient Content of RTS Health Mix With Natural Iron*:** The nutrient content like energy, carbohydrates,protein, fat, crude fiber, sugars as sucrose, moisture and Iron content of the Iron rich Health mix was calculated byanalyzingthesampleinfoodtestinglab.Thecalculatednutritivevalueofthefinalizedvariation ofRTSHealthmixwith natural IronispresentedinTableV.

TableV:NutrientCalculationofRTSHealth MixWithNaturalIron

Parameter	Result
Energy(Kcal/100g)	402.59

Published By :
International Organization of Innovative Research and Publishers (IOIRP)
www.ioirp.com

Carbohydrates(g/100g)	61.98
Protein (g/100g)	14.53
Fat(g/100g)	15.86
Fiber(g/100g)	2.6
Iron(mg/100g)	32
Sugarassucrose(%w/w)	13.56
Moisture(in %)	8.37

Health mix is a Ready-to-use product which is usually composed of variety of cereals, pulses, millets, nuts, andseedsthatarerichinproteinanddietaryfiberandalsoensurestheavailabilityofothermacroandmicronutrients[12].The commercially available health mix is usually formulated with more than 5 ingredients to meet the dailyrequirement of nutrients. Health mix is a natural based nutritive value rich convenience food which is easy to cookwith hot water or using milk and consumes less preparation time. A health mix can be taken as an ideal food by anentirefamily tomeetthedailyrequirementsof nutrients[13].

It is concluded that the variation 3 has high scores in all sensory characteristics and the overall acceptabilitywas very good. It is evident that this new product can be feasible atpilot scale level. Hence it is possible to meetnationalandinternationalexportdemandforIronrich healthmix.Thepresentstudyindicatesthatagoodqualityvalue added product be produced from combination of flaxseed, millets and pulse grains along with naturalsweetener [14].As Flaxseed, millets and pulses grains have health propertiesand nutritive value,itisassumedthatthey could fetch a good welcome from the consumers. Further investigate is necessary to study shelf life andeconomicaspectsoftheproductsbeforerecommendingfor commercialproduction.

IV. CONCLUSION

In conclusion, the formation of RTS iron enriched health mix had wide acceptability among the panelmembers. However, further physiochemical analysis, anti-nutrient analysis and sensory analysis with highernumber of sensory panel members. Based on the present study, RTS health mix can be consider for the healthbenefitofchildren,pregnancyand lactatingwomen,inparticular whoareunderanemic.

Acknowledgement

The authors are thankful to the Head of the Department of Food Technology and Dean,RamaiahUniversityofAppliedScience,Bengaluru,Indiaforthefacilities andopportunity.

References

1. B. P. Marriott, D.F. Birt, V.A. Stallings, A.A. Yates, Present knowledge in nutrition: Clinical andapplied topicsinnutritionAcademic Press,2020.

2. D. Barmavath, K. Divya and B. Dayakar, “Health mix product development by incorporating thebi-productofsorghumflakespowder&pulsesanditsorganolepticevaluation,”JournalofPharmacognosyandPhytochemistry,volume6 issue 5,pp14- 15, 2017.

3. R.GhasemzadehandR.A.Ghavidel,“Processingandassesmentof qualitycharactristicsofcereals-legumescompositeweaningfoods,”InternationalConferenceonBiosciences,Biochemistryand BioinformaticsIPCBEE.IACSIT Press,Singapore, volume5,2011.

4. M. Durairaj, G. Gurumurthy, V. Nachimuthu, K. Muniappan and S. Balasubramanian, "Dehulledsmall millets: The promising nutricereals for improving the nutrition of children. Maternal & childnutrition,"volume15,2019.

5. M. Angel and K.V. Devi, "Effect of garden cress seeds incorporated health mix among selectedanaemic adolescent girls (12-15 years) inDindigul district, Tamil Nadu, India,"InternationalJournalofScientific Research, volume3,issue 11, pp.64-66,2012.

6. Cogswell, M.E. Kettel Khan and U. Ramakrishnan, "Iron supplement use among women in theUnited States:science,policy and practice".The Journalofnutrition,volume133,issue 6,2003.

7. M. C. Hurteau, "Unique new food products contain good omega fats," Journal of Food ScienceEducation,volume3,pp52-53,2004.

8. A.HBaqui,A.H,K.Zaman,L.A.Persson,S.E.Yunus,N.BegumandR.E.Black,"Simultaneous weekly supplementation of iron and zinc is associated with lower morbidity due todiarrhea and acute lower respiratory infection in Bangladeshi infants." The Journal of nutrition,volume*133*,issue 12, pp4150-4157,2003.

9. M. Hutchins and J. L. Slavin, "Effect of flaxseed on sexhormone metabolism," Champaign,Illinois:AOCSPress, pp126-149,2003.

10. P Omran, O. S. Ibrahim and Z. E. O. M. Mohamed, "Quality characteristics of biscuit preparedfrom wheatand flaxseed flour,"Afs-AdvancesinFood Sciences,pp 129,2016.

11. D. R. Peryam and F. J. Pilgrim, "Hedonic scale method of measuringfood preferences FoodTechnol,"volume11,pp9-14, 1957.

12. J.Pongjanta,AngkanaNaulbunrang,SiripornKawangdang,TippawanManonandThirawatThepjaikat, "Utilisation of Pumpkin Powder in Bakery Products," Journal of Science Technol,volume28, issue 1,pp71-79,2006.

13. R.V.Salve,Z.M.Mehrajfatema,M.L.Kadam, andS.G.More,"Formulation, nutritionalevaluation and storage study of supplementary food," Journal of Food Process Technology volume2,issue 6, pp131,2011.

14. M.Watts,G.L.Ylimaki,L.E.JefferyandL.G.Elias,"Basicsensorymethods forfoodevaluation,"Ottawa, 1989.

AuthorsShortProfile:

- SathiyaPriyaR[1] - SathiyaPriyahascompletedherMastersofScienceinFoodScienceandTechnologyfromRamaiahUniversity of Applied Sciences, Bengaluru,Indiainthe year2021.
- Harikrishnan R– Harikrishnan has completed his Masters of Science in Food Science and Technology fromRamaiah University of Applied Sciences, Bengaluru,India in the year2021.
- SreejithS-[1] SreejithhascompletedhisMastersofScienceinFoodScienceandTechnologyfromRamaiahUniversityofAppliedSciences,Bengaluru,Indiaintheyear2021.
- UrmilaH– Urmila is pursuing her Masters of Science in Food Science andTechnologyfromRamaiahUniversityof AppliedSciences, Bengaluru, India.
- RajaduraiM-[2*] RajaduraiiscurrentlyworkingasAssistant ProfessoratDepartmentofFood Technology, Faculty of Life and Allied Health Sciences, Ramaiah UniversityofApplied Science,Bangalore,India.

Published By :
International Organization of Innovative Research and Publishers (IOIRP)
www.ioirp.com