2026 Volume: 02 Issue: 06 www.ijrpa.com ISSN 2456-9995 Research Article

International Journal Research Publication Analysis

Page: 01-10

FORMULATION AND NUTRIENT ANALYSIS OF HEALTH PROMOTING MILLET PODI FORTIFIED WITH RADISH LEAVES

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Article Received: 30 April 2026
Article Revised: 19 June 2026
Published on: 08 July 2026

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DOI: https://doi-doi.org/101555/ijrpa.9546

ABSTRACT

The present study was undertaken to develop a nutritious and acceptable millet-based radish leaf podi by incorporating functional ingredients such as millets and green leafy vegetables. The aim of the study was to enhance the nutritional quality of the product while promoting the utilization of underutilized ingredients like radish leaves in daily diets for health promoting. The main objective of this study was to develop a functional food product using radish leaves to elevate the nutritional quality and sensory acceptability. The podi was prepared using ingredients including millets, radish leaves, curry leaves, garlic, black gram dal, and spices. Different formulations were developed using foxtail millet, little millet, and barnyard millet in varying proportions. Standard processing methods such as roasting, cooling, and grinding were followed for product preparation. The prepared podi were stored at air tight container. The podi was prepared during the study shows high sensory score in all attributes such as appearance, color, texture, aroma, taste, and overall acceptability.Among the formulations, the variation containing little millet and barnyard millet with radish leaves showed the highest acceptability. Nutritional analysis indicated that the developed product is a good source of **protein (11.8 g/100g), carbohydrates(59.5g/100g), fat(9.0g/100g), iron, and calcium, along with low moisture content (6.0 g/100 g),** suggesting good shelf stability. The nutritional analysis and sensory evaluation indicate that it is highly acceptable and nutritious.

KEYWORDS: Functional food, Sensory evaluation, Nutritional analysis, Antinutritional factors, Acceptability, Radish leaves.

INTRODUCTION

One of the most popular cereal grains consumed globally is millets, particularly in dry and semi-arid regions ofAsia (China and India) andAfrica. Their excellent nutritional value and agro-industrial significance make them highly interesting. There are seven main varieties of millets, each with a unique color, shape, size, and cultivation region. These small-seeded, round-shapedgrains,whicharemembersofthePoaceaefamily, aretheoldestandmostlikely the first cereal grain known to humans for domestic use. Millet's nutritional profile resembles that of key staple grains (rice, wheat, and maize), as they provide a rich supply of carbohydrates, protein, dietary fiber, vitamins, micronutrients, and phytochemicals. Millets offer energy between 320–370 kcal per 100 g when consumed. Millets contain a higher percentageof non-starchy polysaccharides and dietary fiber than staplegrains, accounting for 65–75% of their carbohydrate content. Millets rich in dietary fiber offer various health advantages, including enhancing gastrointestinal health, improving blood lipid levels, and facilitating blood glucose clearance. Millets that are low in gluten and have a low glycemic index are nutritious choices for celiac disease and diabetes.

Radish greens are frequently thrown away as trash. Market studies indicate that a significant portionofradish leaves iseither thrownaway in the fieldduringharvestingor cut offroughly 20 days prior to harvest to boost the yield. Their primary role is to assist with digestion and balanceqi.Radishgreensareabundantinvitamin C,riboflavin,folicacid,andothernutrients, along with zinc, magnesium, iron, calcium, and various trace elements. Recent nutritional research indicates that radish leaves possess greater nutritional benefits than radish roots in various ways. For example, the amount of vitamin C in radish leaves is twice that found in radish roots, and the quantities of calcium, magnesium, iron, zinc, riboflavin, and folic acid were observed to be 3 to 10 times greater in radish leaves than in radish roots.

Millet Radish Leaf Podi is a nutritious and flavorful dry chutney powder made using millets and fresh radish leaves. Radish leaves, often overlooked, are rich in vitamins, minerals, and antioxidants, making the mavaluable addition to everyday meals. When combined with millets known for their high fiber content and health benefits this podi becomes a wholesome and sustainable food option.

Traditionally prepared with spices, lentils, and dried ingredients, this podi offers a balanced blendoftasteandnutrition.Itcanbeenjoyedwithrice,idli,dosa,orevensprinkledoversnacks

toenhanceflavor.MilletRadishLeafPodinotonly helpsreducefoodwastebyutilizing leafy tops but also promotes the use of millets as a healthy alternative to refined grains.

MATERIALS AND METHOD

Themilletradishleafpodiisadrychutneypowderfoodproductbycombiningingredientsand blending them together. This podi is ready to eat.

Study design

An experimental research design was used to develop millet radish leaf podi using selected functional ingredients. The study include formulation, preparation and development of the product, followed by nutrient analysis.

Selection

Theingredientswereselected,suchasmillets,radishleaves,curryleaves,garlic,dryredchilles andspiceswereselectedbasedonthenutritionalvalueandavailability.Differentcombination were developed to get the taste and texture.

PROCESSOFPREPARATIONOFLITTLE ANDBARNYARDMILLETRADISH LEAF PODI

STEP-1:**DryRoast Millet**

Heatpan→addmillet

Roasttillaromatic&slightlygolden STEP -2: **Roast Radish Leaves**

Addafew drops oil

Sauteleavestilldry&moistureevaporates STEP-3**: Roast Spices**

Dryroast:curryleaves,redchilies,cuminseeds,garlic,blackgramdal,corianderseeds STEP-4:**Cool**

All Ingredients

Leteverythingreachroomtemperature STEP-5:**Grinding**

Firstgrindmillet→coarsepowder

Addleaves+spices+salt

Grindtoslightlycoarsepoditexture STEP-6: **Adjust Flavor**

Taste→adjustsalt/spicelevel

SENSORYEVALUATION

Sensoryevaluationwas conductedtoassesstheacceptabilityofmilletradishleafpodibaseon attributes such as appearance, colour, texture, aroma, taste, and overall acceptability.Apanel of 50 members evaluated the developed sample using a 5 point hedonic scale ranging from "Poor"to"Excellent".Differentformulationsincorporatingmillets,radishleaves,curryleaves, garlic were prepared and presented. The panelists recorded they responses individually in a structuredscorecardforeachsensoryparameter.Thecollecteddatawereusedtodeterminethe most acceptable formulation based on mean sensory score.

5-pointHedonic Scale

The 5-point hedonic scale is a simple and commonly used method in sensory evaluation. It measures how much panel members like or dislike a food product. This scale has five levels that show the degree of preference. It is particularly helpful when using untrained panelists because it is easy to understand and apply.

ScaleFormat Excellent-5 Very good-4 Good-3 Average-2 Poor-1

Thisscalewasgiventothepanelisttoassessoverallacceptabilityorspecificattributesorsuch as taste, aroma, texture, taste, appearance and over all acceptability.

Differentformulationsincorporatingmilletsandradishleavespodifoxtailmillet,littlemillet withradishleaves,andlittleandbanyardmilletwithradishleaveswerepreparedandpresented. The panelists recorded their responses individually in a structured scorecard for each sensory parameter. The collected data were used to determine the most acceptable formulation based on mean sensory scores.

The sensory evaluation results indicated that the formulation incorporating little and banyard millet radish leaf podi showed higher overall acceptability compare to other variations

STATISTICALANALYSIS

To check the statistical significance of overall acceptability of the podi, one sample t-test was performed on hedonic score.

T-testformula

$t = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

n=Samplesize $\bar{x}$

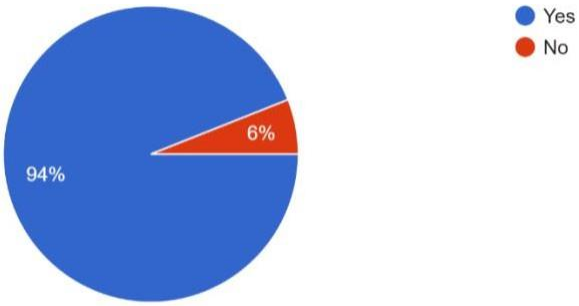
= Mean

μ=Hypothesizedmean

σ=Standarddeviation

RESULT AND DISCUSSION

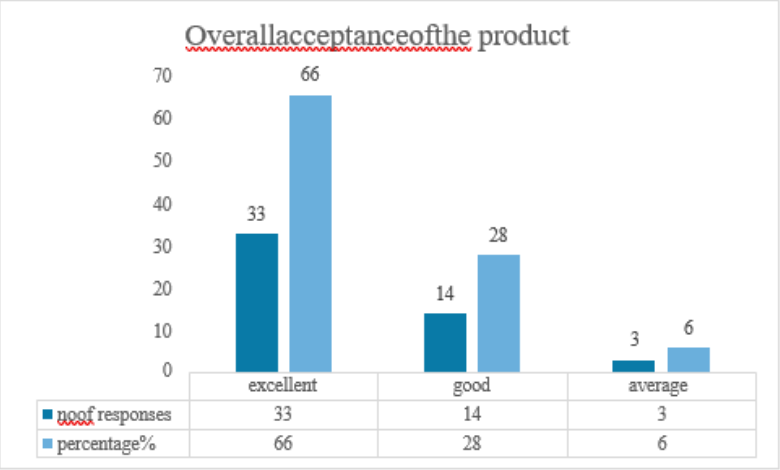
DOYOU LIKETHISPRODUCT



Figno:1Doyoulikethis product.

The above pie chart shows that almost all the responders **94%** of them are liked the product only few of them **6%** of them are not liked. This indicates that positive response.

OVER ALL ACCEPTANCE OF THE PRODUCT



Figno:2 Over all acceptance of the product.

Theabovegraphshowsthatoverallacceptanceoftheproduct,theresponsesare33individuals **66%** excellent, 14 individuals **28%** good, only 3 individuals **6%** are kept average. This indicatesthatmajorityof therespondersarepositive response,theyareacceptingtheproduct.

STATISTICALTEST

Onesamplet-test:

N(samplesize)=50

Mean=sumofoverall-acceptability/samplesize Mean= 220/50= 4.4

Standarddeviation(σ)=19.6/50=0.39

HYPOTHESIS:

Ho - The product has neutral acceptability (i.e. there is no significant different in liking or disliking among the panelist).

H_1 = The product is liked I disliked Significantly (i.e. acceptability differs significantly from neutral).

CALCULATIONof't'value:

$$T=\frac{x-\mu}{\sigma/\sqrt{n}}=\frac{4.4-3}{0.39/\sqrt{50}}=\frac{1.4}{0.05}=28$$

Pvalueis<0.0000

The result is statically significant.

Meanvalueis>3(i.e.4.08).Thisstatesthatpanelistlikedtheproduct.

CONCLUSION

One sample t-test was conducted for overall acceptability scores of sensory evaluations (Hedonictest)anditwasobservedthatthepvalueis <0.05.Thisconcludesthattheproductis liked significantly. (mean>3) (calculated mean (4.08) hypothesized mean (3)).

NUTRIENTANALYSISFORMILLETRADISHLEAVES PODI

Nutrient analysis was carried out to determine the nutritional composition of the Podi. Parameters such as protein, fat, carbohydrate, moisture, ash, micro nutrient iron and macro nutrient calcium content were analyzed. Standard analytical methods were used for all

estimations. The results helped assess the nutritional quality of the developed product.

Tableno:1Interpretationofnutritionalanalysis.

S.No	Parameter	TestMethod	Unit	Result
1	MoistureContent	Oven Drying Method	g/100 g	6.0
2	Protein	Kjeldahl Method	g/100g	11.8
3	TotalFat	SoxhletMethod	g/100g	9.0
4	Ash	MuffleFurnace	g/100g	6.8
5	Carbohydrates	By calculation	g/100g	59.5
6	Iron	AAS	mg/100g	7.0
7	Calcium	AAS	mg/100g	240

Protein:Theproteincontentwas11.8g/100g,indicatinggoodsourceofprotein

TotalFat:Thefatcontentwas9.0g/100g,withinthe standard limit

Carbohydrate:Thetotalcarbohydratescontentwas59.5g/100g,contributingtoenergysupply

Iron:TheIroncontentwas7.0gm/100mg,indicatingthegoodsourceofiron

Calcium:The calciumcontentwas240mg/100mg,contributinggoodcalcium

Moisturecontent:Themoisturecontentwas6.0g/100g,thatindicatesgoodshelf stability

Ash:Theashcontentwas 6.8g/100g

CONCLUSION

The study successfully developed a nutritious and consumer-acceptable millet-based radish leafpodi. The formulation containing little millet and barnyard millet withradish leaves showed the highest acceptability. The product is rich in protein, iron, and calcium, has low moisture content for better shelf life, and was significantly liked by consumers. Therefore, it can be considered a healthy, cost-effective, and functional food product with good commercialization potential and benefits for improving dietary habits.

ACKNOWLEDGEMENT

The authors express their sincere gratitude to the Management, Principal, and Department of NutritionandDietetics, Kasturba GandhiDegreeandPGCollegeforWomen,Hyderabad,for providing guidance, encouragement, and facilities to carry out the study successfully. The

authors are also thankful to all the students who willingly participated in the research and provided valuable information for the completion of the study.

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