1. **Project reference number**:- **46S_MSC_156**

2. **Tittle of the Project**: - **DEVELOPMENT OF FUNCTIONAL FOOD PRODUCTS USING PROCESSED BROWN TOP MILLET WITH FRUIT AND VEGETABLE WASTE TO ENHANCE AGAINST COVID INFECTION**

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Gallic acid

Total Flavonoid content

Rutin

Germination

Microwave Roasting

Banana peel

Blanching

INTRODUCTION

Brown top millet (*Brachiaria ramosa*) is small-seeded annual grass cultivated as grain crop, primarily on the marginal lands in dry areas, subtropical and tropical areas. It is increasingly receiving attention of the scientific community due to superior nutritional quality. *(Prabhu et., al 2018)*. The nutritional content was found in Brown top millet (BTM) per 100gm. *(Shanthi et al., 2021)* Energy ranges from 338.0 kcal to 368.62 kcal. The carbohydrate, crude fiber and fat content are 71.32 gm, 8.06–16.08%, and 1.89 gm, respectively. Protein is between 11.64% and 10.72%. Furthermore, it is a rich source of micro nutrients such as iron, calcium, potassium, magnesium, zinc, phosphorus, and B group Vitamins (*Sarita and Singh, 2016).*

In addition, it found that high bioactive compounds which are involved in fight against infections and boost immunity. Brown top millet is naturally gluten-free, Post-COVID, people with weakened immune systems or gastrointestinal problems may benefit from consuming glutenfree foods to aid digestion and promote better nutrient absorption. It contains phytochemicals that have anti-inflammatory properties. This makes it a good choice for people experiencing post-COVID inflammation, such as respiratory issues, joint pain, and digestive problems. Millet contains an abundance of bioactive compounds with antioxidant activity. Brown top millet contains phytochemicals such as flavonoids, quinones, tannins, and resin.

The intake of antioxidants through the diet is essential for improving human health. The Millet contains several natural occurring phenolic compounds which include phenolic acids, flavonoids and tannins, in addition to xylo-oligosaccharides (XOs), insoluble fibers and peptides. Certain lipophilic antioxidants, including vitamin E and carotenoids, were distributed among varieties *(Shivani et al., 2022).*

There is plentiful scope for development and standardization of value added products made from Brown top millets such as ready to eat foods (cookies, bars, deserts, etc.) and ready to cook foods (idli mix, poha, etc.) in which the millet can be used in combination with other cereal grains. Brown top millet holds great potential in alleviating food and nutrition insecurity. It has good nutritional value. It can be used for the prevention and management of several non-communicable diseases *(Singh et al., 2022).*

Our project aims that using kitchen waste to bring out nutritious food and enhancing with millet. Using processed Brown-top millet to improve nutritional quality and sensory parameters. Kitchen wastes are Banana peel and vegetable stalks.

Banana peel contains nutrients such as vitamins B6 and C, which are important for maintaining a healthy immune system. A strong immune system is crucial for fighting off infections, including COVID infections and rich source of antioxidants such as polyphenols, which can help reduce inflammation and oxidative stress caused by COVID infections. This can aid in the recovery process and boost the immune system. Banana peel contains prebiotics, which are essential for maintaining a healthy gut micro-biome. A healthy gut micro-biome can help boost the immune system and reduce inflammation.

The bioactive compounds found in some vegetable waste have been shown to possess anti-inflammatory properties that can help reduce inflammation in the body.

Figure 1: Brown top millet

OBJECTIVES

1. To analyse phenolic, flavonoid and antioxidant content of unprocessed and processed (Germination and Microwave roasting) Brown-top millet.
2. To quantify nutritional and phytochemicals content in mixture of fruit vegetable waste (banana peel and vegetable stalks) and processed brown top millet prior to the development of the product.
3. Preparation of food product with the mixture
4. Re-analysis of post product development
5. Sensory evaluation of developed food products

6. Sensory evaluation and analysis of developed products.

Methodology:

The sample will be collected from research institute. Formerly undergo different processing are germination and microwave roasting. At that time raw sample undertake for extraction of total phenolic, flavonoid, reducing power, and antioxidant activity by solvent.

1**. Determination of phenolic content** –

● Total polyphenolic content is estimated spectrophotometrically - Folin ciocealteau reagent (FCR) using gallic acid as a standard.
● To the 10 gm of the suitably diluted sample extract, 2.9 ml of deionized water and 0.5 ml of Folin ciocealteau reagent and 2.0 ml of 20% Na_2CO_3 solution was added.
● The mixture is allowed to stand for 90 min and absorption is measured at 760 nm against water as a blank.
● The amount of total phenolics is expressed as gallic acid equivalent (GAE, mg gallic acid/g flour) through caliberation of Gallic acid.

2. Total flavonoids-

● Total flavonoids are measured by a colorimetric assay.
● A 1 ml sample extract is added to a 10 ml volumetric flask containing 4ml of distilled water.
● A 0.3 ml portion of 5% $NaNO_2$ is added to this mixture and allowed to stand for 5 min at room temperature.
● A 0.3ml portion of 10% $AlCl_3.6H_2O$ is added and the mixture is allowed to stand for 6 min at room temperature.
● Two millilitres of 1N NaOH is added and the solution is diluted to the desired volume (10 ml) with distilled water.
● The absorbance of the solution versus a blank at 510 nm is measured immediately.
● The results are expressed as Rutin equivalents (RE) using a standard curve (absorbance versus concentration) prepared.

Preparation of sample:

Germination: Germination of brown top millet room temperature. The brown top millet is kept for soaking in distilled water for 24 hours after drained the water. Furthermore millets are spread over wet muslin cloth and covered with wet muslin cloth for 24 hours. In addition for maintaining moisture was sprayed water. The total time was taken for full potential of germination is 48hours. Kept for drying in hot air oven at 60℃ for 5hours due to complete

removal of moisture, for further investigation the samples are grounded in laboratory condition and kept in air tight container.

Microwave roasting: Three sets of raw samples of brown top millet are taken 10gm, 15gm and 20gm respectively. 10gm raw sample are taken in a glass beaker (100ml) and placed in a centre of the microwave oven for 50 seconds. Brown top millet got roasted and little puffed.

Microwave roasted sample

Blanching of banana peel:

Selected red coloured ripe banana peels, then rinsed the banana peels under cold water to remove any dirt or debris on the surface. Bring water to a boil to generate steam to blanching. Carefully place the banana peels in plate. Then steam has given for 15minutes to avoid loss of product firmness. The samples were kept in cool water for 2 min. then dried and grinded for further use.

Blanching of Banana peel.

Development of product: Brown top cookies

Preparation on product: The material required were purchase from local market. Brown top millet was clean, microwave roasted and grinded in blender. The banan peel were clean , balanced, dryed and then grinded in blender to make fine powder.

Ingredients	Quantity
Brown top millet	70g
Maida	30g
Red banana peel	15g
Jaggery	75g
Butter	20g
Baking powder	½ tsp
Salt	As per the taste
Milk	½ cup

Procedure

Clean the millet and roasted in microwave and grinded. Grind jaggery to a fine powder. In a wide bowl, beat butter until it turns fluffy. Add jaggery powder. Beat again together until they turn fluffy and a light mixture is formed. Add millet flour, maida, baking powder and salt to a sieve. Shift everything together. Mix gently with butter mixture. Add milk to form firm dough. (Bring it together). Rest the dough kept for 10 mins at room temperature. Take dough of size about 16 grams for each cookie and rolled it into 1/4 inch thickness (0.68cm) and cut into circles of 2 inch diameter (5.08cm). Preheat the oven for 10 mins at 175 degree celsius. Transfer cookies to a baking sheet lined with parchment paper. Poke the cookies on top using a fork. Bake at 175 degree celsius for 20 minutes. After baking, let the cookies cool down completely on a wired rack and the cookies are ready to serve.

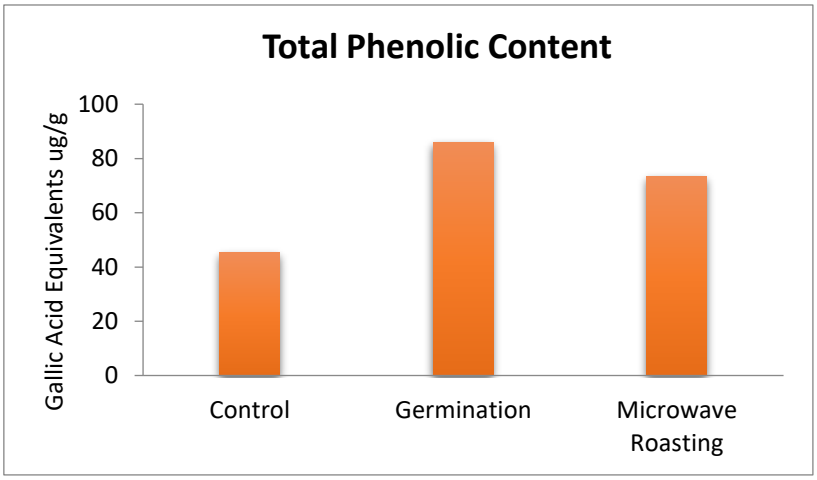
Cookies made with brown top millet and banana peel

RESULT AND CONCLUSION:

The phytochemicals analysis was done for germinated and microwave roasted samples. The Phenolic Content of each extract is determined according to the Folin-Ciocalteu spectrophotometric method explained by *Gao et al (2002).*

Total phenolic content found in control sample 45.52 GAE µg/gm of crude extract The result were agreed with Sonia et al., 2021 were evaluated comparison with control sample and fermented sample.

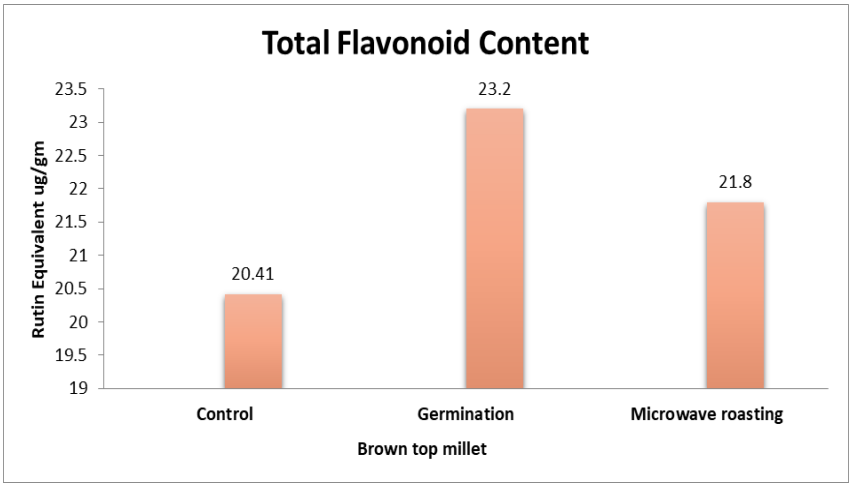
Among germinated brown top millet sample total phenolic content was found 85.8 GAE µg/gm of crude extract and in microwave roasted sample total phenolic content was found 73.2GAE µg/gm. of crude extract. The result was found there is increment in germinated samples by 88%. It may be attributed to release of bound phenols in water during soaking. In addition cell wall structure of grain and bound phenolic were get liberated by action of degrading cell wall enzymes (esterase) on these bonds. *(Sharma et al., 2015).* The same result was found in germinated foxtail millet.



Microwave roasting:

The results were found is increased in microwave roasting by 62%. Because reason could be phenolic compounds formed during Millard reaction of roasted seed samples. The phenolic content showed significant increment in roasted BTM sample which may be due to generation of heat induced and extractable phenolic. The breakdown of cellular constituent's results in release of bound phenolic acids and associated Millard reaction further contribute in the process. Heat induced increase in total phenolic has been reported in roasted barley *(Gallegos-Infante, Rocha-Guzman, Pulido-Alonso, 2010).*

Total flavonoid content found in control sample 20.41 RE µg/gm. The result were agreed with Sonia et al., 2021 were evaluated comparison with control sample and fermented sample. Among germinated brown top millet sample total Flavonoid content was found 23.2 RE µg/gm and in microwave roasted sample total Flavonoid content was found 21.8 RE µg/gm



The result was found there is increment in germinated samples by 13.66%. It may be attributed to release of flavonoid in water during soaking. In addition cell wall structure of grain and bound Flavonoids were get liberated by action of degrading cell wall enzymes (esterase) on these bonds. *(Sharma et al., 2015*). The same result was found in germinated foxtail millet. The results were found is increased in microwave roasting by 6.81%. Because could be attributed to flavonoid compounds formed during Millard reaction of roasted seed samples.

*Note: continued study on product analysis, sensory evaluation and shelf-life of the product.

SCOPE

Currently Covid-19 pandemic is a leading challenge across the globe. It is mandatory to attain and maintain good nutritional status to fight against virus. Optimal nutrition and dietary nutrient intake impact the immune system, therefore the only sustainable way to survive in current context is to strengthen the immune system. For giving importance to nutrition during covid-19, this project based on using technologies to develop new product with enriched nutritive value by Brown top millet. Overall the development of functional food products using processed brown top millet with the fruit and vegetable waste to enhance

immunity against COVID 19 infection can have significant societal benefits, ranging from improved health to economic opportunities and sustainable use of resources.