

Determining the Potential of Millet–Rich Whole Wheat Mushroom Biscuit as a
Nutraaceutical Intervention for Enhanced Cardiovascular Health and Metabolic Disorders in
Athletes

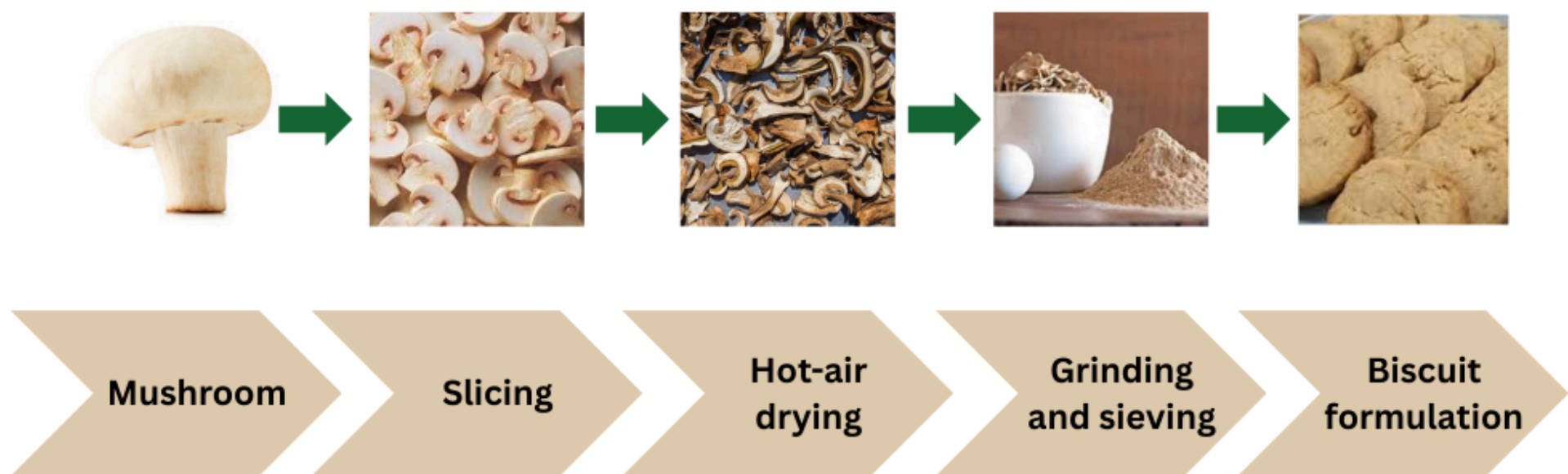
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INTRODUCTION & AIM

Athletes require convenient, whole-food-based functional food (Food rich in millets, protein, healthy fats, complex carbohydrates, and micronutrients) to manage cardiovascular health and metabolic disorders, aiding in the prevention and management of diabetes. Mushroom-fortified millet biscuits combining multiple bioactive compounds. This mushroom contains bioactives such as Ergothioneine (potent antioxidant), Beta-glucans (dietary fibre, immune support), and High-quality protein (amino acid profile). For athletes, the nutritional profile translates to direct benefits in cardiovascular support and sustained energy & body composition. **Objective:** Develop and optimize a nutritionally-enhanced biscuit for athletic performance, cardiovascular support, and sustained energy.

METHOD

Mushrooms are perishable and can only be stable for about 24-48 hours at ambient temperature. Drying can be a good preservation method for mushroom storage and for fortification. Prior to drying, they were thoroughly washed to remove dirt. The mushroom slices were air-dried at an air temperature of 50°C in a cross-flow type dryer with air flow rates of 1.5m/s. Slices were spread in a single layer on the tray.



After grinding and sieving, the powder was used for biscuit formulation with 15-20% of mushroom powder with millet flour integration. Ingredients were mixed and baked at a suitable temperature (180°C) for 12-15 minutes. Different analytical methods, such as protein, fat, ash, and fibre estimation, DPPH for antioxidants, HPLC-DAD for ergothioneine quantification, and Enzymatic Megazyme for β -glucan analysis, were used to quantify the data. Sensory evaluations were used to assess consumer approval.

RESULTS & DISCUSSION

Result Category	Data Provided
Proximate Composition	+49.5% protein, +293.6% fiber increases
Ergothioneine Content	18.5-24.8 mg/100g (2.2-3.1 mg per biscuit)
Total Phenolics	68.4-89.6 mg GAE/100g
β -Glucan	2.8-3.6% (335-450 mg per biscuit)
Antioxidant Activity	DPPH IC ₅₀ 67-75% improvement; FRAP 236-327% increase
Sensory Scores	7.7/9.0 overall acceptability (optimal 15% formula)
Nacl Content	2 grams



The mushroom-millet biscuit demonstrates significant nutritional enhancement over conventional wheat-based biscuits, with 15-20% mushroom powder yielding 49.5-67% higher protein, and some more stated above. These bioactive compounds address key athletic needs, reduce LDL and modulate postprandial glycemia, offering cardiovascular protection and sustained energy superior to typical sports nutrition products. These findings validate mushroom powder as an effective functional ingredient for athletes targeting cardiovascular and metabolic health optimization.

CONCLUSION

The mushroom powder is effective as functional ingredient, gives comprehensive nutritional benefits including cardiovascular & metabolic support mechanisms, and it supports clinical significance.

FUTURE WORK / REFERENCES

- Randomized controlled trials with athletes
- Investigate dose-response effects on gut microbiome or for immune support
- Shelf-life stability studies
- Expand sensory trials to athlete cohorts