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Fortified Gummies: A Review of Nutritional Composition and Applications

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Abstract-- Food fortification is a widely adopted strategy to enhance the nutritional quality of foods by incorporating essential micronutrients, thereby addressing global deficiencies and improving public health. In recent years, fortified gummies have emerged as a novel and consumer-friendly delivery system within the nutraceutical sector. These chewable formulations combine essential nutrients such as vitamins, minerals, probiotics, and herbal extracts with improved palatability and ease of consumption. This review provides an overview of fortified gummies, focusing on their types of fortification, formulation and composition, bioavailability, efficacy, advantages, and limitations. The role of different micronutrients, including iron, calcium, zinc, and vitamins, along with functional ingredients such as probiotics and herbal bioactive, is discussed in relation to their health benefits. Additionally, recent advancements and future prospects in gummy-based delivery systems are highlighted. Despite certain challenges such as stability issues and sugar content, fortified gummies offer significant advantages in terms of patient compliance and acceptability, particularly among children and individuals with swallowing difficulties. Overall, fortified gummies represent a promising and innovative approach for improving nutrient intake and addressing micronutrient deficiencies in diverse populations.

Keywords-- Food fortification, fortified gummies, nutraceuticals, micronutrients, bioavailability, functional foods

I. INTRODUCTION

Food fortification is defined as the deliberate addition of essential nutrients to commonly consumed foods in order to improve their nutritional quality and address micronutrient deficiencies in the population (1) It is considered one of the most effective and economical public health strategies to combat “hidden hunger,” a condition where individuals suffer from deficiencies of vitamins and minerals despite having adequate caloric intake. Organizations such as the World Health Organization (WHO) have strongly promoted food fortification as a key approach to reduce global malnutrition, particularly in developing countries (2).Fortification is widely used across the world in staple foods such as salt, milk, flour, and cereals (3) For example, iodized salt helps prevent iodine deficiency disorders, while fortified milk and cereals provide vitamins such as A, D, and B-complex.

The primary micronutrients used in fortification include iron, zinc, iodine, calcium, and essential vitamins like vitamin C, vitamin D, folic acid, and vitamin B12. These nutrients play crucial roles in maintaining immunity, supporting growth and development, improving bone health, and preventing conditions such as anemia and rickets. Fortification can also extend beyond traditional nutrients to include probiotics, omega-3 fatty acids, and even herbal or plant-based extracts that offer additional functional or therapeutic benefits (4). In recent years, the concept of fortification has expanded into more consumer-friendly formats, among which fortified gummies have gained significant attention. Gummies are chewable, gel-based formulations that combine nutritional ingredients with appealing flavours and textures, making them particularly suitable for children and individuals who have difficulty swallowing conventional tablets or capsules. These products are now being developed with targeted health benefits, such as gummies for hair growth, skin health, immunity, and general wellness. Common ingredients in such formulations include biotin for hair health, vitamin E for skin protection, vitamin C for immunity, and zinc for metabolic support. The ability to incorporate multiple nutrients into a single, palatable dosage form enhances both convenience and compliance (5). The increasing popularity of fortified gummies can be attributed to their ease of consumption, improved taste, and adaptability to different dietary preferences, including vegetarian formulations using pectin instead of gelatine. According to WHO-supported perspectives on nutrition interventions, improving nutrient intake through accessible and acceptable formats is essential for the success of fortification programs. In this context, gummies represent a modern and innovative extension of traditional fortification strategies (6). Overall, fortified gummies demonstrate strong potential as a delivery system for essential nutrients. Their consistency in formulation, combined with their wide acceptance among children and adults, makes them a promising tool in addressing micronutrient deficiencies. Furthermore, their suitability for vegetarians and their appeal to younger populations enhance their practical application.



As a result, fortified gummies are emerging as a trending and effective approach in the field of nutrition and public health, with the potential to contribute significantly to the prevention and management of nutrient deficiencies (7)

II. TYPES OF FORTIFICATION IN GUMMIES

Fortified gummies can be categorized based on the type of nutrients and functional ingredients incorporated into them. The most common category includes vitamin-fortified gummies, which contain essential vitamins such as vitamin C, vitamin D, and B-complex vitamins that support immunity, bone health, and energy metabolism. Mineral-fortified gummies are another important type, often enriched with iron, zinc, and calcium to address deficiencies such as anemia and support overall physiological functions. In addition to conventional nutrients, probiotic-fortified gummies have gained popularity due to their role in maintaining gut health and improving digestion. These formulations contain beneficial microorganisms that contribute to a healthy intestinal microbiome. Furthermore, herbal or plant-based fortified gummies are also emerging, incorporating natural extracts such as aloe vera, turmeric, and other botanicals known for their therapeutic properties. Functional gummies designed for specific health benefits represent another growing category. These include gummies formulated for hair growth, skin health, immunity enhancement, and general wellness. Ingredients such as biotin, collagen, vitamin E, and antioxidants are commonly used in these formulations to target specific physiological outcomes. Thus, fortified gummies provide a versatile platform for delivering a wide range of nutrients and functional compounds in an acceptable and consumer-friendly form (8)

Iron Fortification in Gummies

Iron is one of the most commonly used micronutrients in food fortification due to the high global prevalence of iron deficiency anemia. It plays a crucial role in haemoglobin formation, oxygen transport, and overall metabolic function. Iron-fortified foods have been widely used as an effective strategy to improve iron status, especially among children, women, and vulnerable populations. Studies have shown that dietary iron fortification is a practical and economical approach to reduce anemia and improve health outcomes (9). In the context of gummies, iron is incorporated in bioavailable forms such as ferrous sulfate or iron complexes, making it easier for consumption compared to traditional tablets. Iron-fortified gummies are particularly beneficial for individuals who have difficulty swallowing pills, improving compliance and regular intake. However, challenges such as metallic taste, stability, and interaction with other ingredients must be considered during formulation (10)

Vitamin Fortification in Gummies

Vitamins are among the most widely incorporated nutrients in fortified gummies due to their essential role in maintaining overall health and preventing deficiencies. Commonly used vitamins include vitamin C, vitamin D, and B-complex vitamins such as B12 and folic acid. Vitamin C is important for immune function and antioxidant protection, while vitamin D plays a key role in calcium absorption and bone health. B-complex vitamins support energy metabolism and neurological functions. Vitamin-fortified gummies are particularly popular among children and adults who prefer an alternative to tablets. These formulations enhance compliance due to their pleasant taste and ease of consumption. However, certain vitamins are sensitive to environmental conditions such as heat, light, and moisture, which may affect their stability and potency during storage. Despite these limitations, vitamin-fortified gummies remain an effective and consumer-friendly method for improving daily nutrient intake (11)

Calcium Fortification in Gummies

Calcium is an essential mineral required for the development and maintenance of strong bones and teeth, as well as for proper muscle and nerve function. Calcium deficiency can lead to conditions such as osteoporosis and weakened bone density, particularly in elderly individuals and postmenopausal women. Fortification of foods with calcium is a widely adopted strategy to improve bone health in populations with inadequate dietary intake. Calcium-fortified gummies provide a convenient and palatable option for supplementation, especially for individuals who have difficulty consuming dairy products or swallowing tablets. These gummies often contain calcium salts such as calcium carbonate or calcium citrate. However, challenges such as limited solubility and potential interactions with other ingredients may affect absorption and formulation stability. Despite these issues, calcium gummies are gaining popularity due to their ease of use and consumer acceptance (12)

Zinc Fortification in Gummies

Zinc is an important trace element involved in numerous biological functions, including immune response, wound healing, and enzyme activity. Zinc deficiency is associated with impaired immune function, delayed growth, and increased susceptibility to infections. As a result, zinc fortification is commonly implemented in foods and dietary supplements to address these health concerns. Zinc-fortified gummies are increasingly used as a convenient supplementation method, particularly for children and individuals with dietary deficiencies.



These formulations help improve compliance due to their taste and chewable form. However, excessive intake of zinc may lead to adverse effects, and therefore proper dosage and formulation are important considerations. Overall, zinc-fortified gummies serve as an effective approach to support immune health and nutritional balance (13).

Probiotic Fortification in Gummies

Probiotic-fortified gummies represent an emerging category of functional foods designed to promote gut health and overall well-being. Probiotics are live microorganisms that provide health benefits when consumed in adequate amounts, primarily by improving the balance of intestinal microbiota. They are commonly used to support digestion, enhance immunity, and prevent gastrointestinal disorders. In gummy formulations, probiotics are incorporated in stable forms to maintain their viability during processing and storage. These gummies offer a more appealing alternative to traditional probiotic capsules, particularly for children. However, maintaining the stability and survival of live microorganisms in a gummy matrix can be challenging due to environmental factors such as temperature and moisture.

Despite these challenges, probiotic gummies are gaining popularity as an innovative delivery system for gut health support (14).

Herbal / Functional Fortified Gummies

In addition to vitamins and minerals, gummies are increasingly being fortified with herbal extracts and functional ingredients to provide targeted health benefits. These include compounds such as biotin for hair growth, collagen for skin health, turmeric for anti-inflammatory effects, and aloe vera for digestive support. Such formulations are often marketed for specific purposes like hair, skin, immunity, and general wellness. Herbal and functional gummies appeal to consumers seeking natural and plant-based alternatives for health improvement. They are especially popular among younger populations and those interested in preventive healthcare. However, the efficacy of such products depends on the quality, concentration, and bioavailability of the active ingredients. As research in this area continues to grow, these gummies are expected to play an increasingly important role in personalized nutrition and functional food development (15).

Table1:
Types of Nutrient Fortification in Gummies and Their Health Benefits

Type of Fortification	Nutrients/Ingredients	Function	Health Benefits
Iron Fortification	Ferrous sulphate, iron complexes	Haemoglobin formation	Prevents anemia
Vitamin Fortification	Vitamin C, D, B12	Metabolism & immunity	Boosts immunity, bone health
Calcium Fortification	Calcium carbonate, citrate	Bone formation	Prevents osteoporosis
Zinc Fortification	Zinc salts	Enzyme function	Improves immunity, growth
Probiotic Fortification	Lactobacillus, Bifidobacterium	Gut microbiota balance	Improves digestion
Herbal/Functional	Biotin, collagen, plant extracts	Targeted action	Hair, skin, stress relief

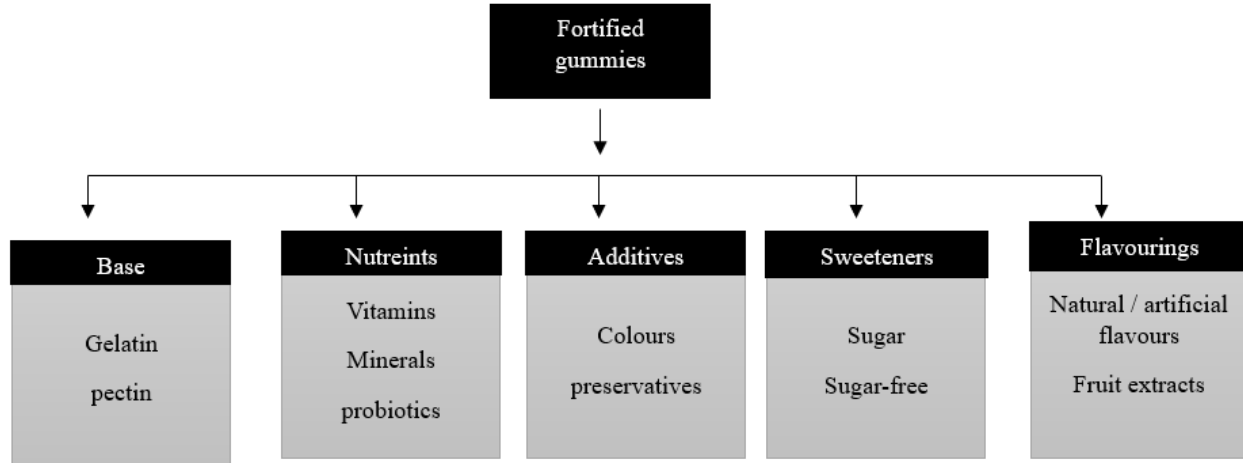


Figure 1: General Composition of Fortified Gummies

III. BIOAVAILABILITY AND EFFICACY

Bioavailability refers to the extent and rate at which nutrients are absorbed and utilized in the body. In fortified gummies, nutrients are generally present in readily digestible forms, which may support effective absorption. The chewable nature of gummies allows initial breakdown in the oral cavity, potentially aiding nutrient release. Studies suggest that for certain vitamins, such as vitamin C and vitamin D, the bioavailability from gummies is comparable to that of traditional dosage forms like tablets and capsules. However, the efficacy of fortified gummies may be influenced by formulation factors such as ingredient stability, interaction between nutrients, and storage conditions. Heat, light, and moisture can degrade sensitive nutrients, thereby affecting their potency. Despite these limitations, gummies provide a practical and acceptable delivery system, especially for populations with compliance issues (16).

IV. APPLICATIONS OF FORTIFIED GUMMIES

Fortified gummies have a wide range of applications in the fields of nutrition, healthcare, and functional foods. They are commonly used as dietary supplements to provide essential vitamins and minerals, helping to prevent and manage micronutrient deficiencies. In paediatric and geriatric populations, gummies serve as an effective alternative to conventional dosage forms due to their ease of consumption and improved compliance. In addition to basic nutritional support, fortified gummies are increasingly used for targeted health benefits such as immunity enhancement, bone health, digestive support, and skin and hair care.

Probiotic gummies are utilized to promote gut health, while formulations containing biotin, collagen, and antioxidants are designed for cosmetic and wellness purposes. Herbal and functional gummies are also being explored for their role in stress management, metabolic health, and overall well-being (17). Furthermore, fortified gummies have potential applications in preventive healthcare, where regular consumption can help maintain adequate nutrient levels and reduce the risk of chronic deficiencies. Their adaptability, palatability, and versatility make them a promising delivery system in modern nutraceutical and pharmaceutical industries (18).

V. ADVANTAGES OF FORTIFIED GUMMIES

Fortified gummies offer several advantages over conventional dosage forms. They are easy to consume and do not require water, making them suitable for children, elderly individuals, and patients with swallowing difficulties. Their pleasant taste and appealing texture improve patient compliance and encourage regular intake. Gummies can also incorporate multiple nutrients into a single formulation, providing convenience and enhancing nutritional support (19). Additionally, the availability of vegetarian formulations using pectin instead of gelatin makes them suitable for a wider population. Their portability and ease of storage further contribute to their popularity as a modern nutraceutical option (20).

VI. LIMITATIONS OF FORTIFIED GUMMIES

Despite their advantages, fortified gummies have certain limitations. Many formulations contain high levels of sugar, which may not be suitable for diabetic individuals or those monitoring calorie intake.

There is also a risk of overconsumption due to their candy-like appearance, particularly among children. Furthermore, maintaining the stability of nutrients, especially vitamins and probiotics, can be challenging during processing and storage (21). Dose inconsistency and limited capacity for high-dose nutrients are additional concerns. Therefore, careful formulation and proper labelling are essential to ensure safety and effectiveness.

VII. FUTURE SCOPE

The future of fortified gummies appears promising with ongoing advancements in formulation and nutraceutical research. Development of sugar-free and low-calorie gummies is expected to address current health concerns. Innovations in encapsulation techniques may improve the stability and bioavailability of sensitive nutrients such as probiotics and vitamins (22). There is also increasing interest in personalized nutrition, where gummies can be tailored to meet individual health needs. The incorporation of novel functional ingredients, including plant-based bioactive and omega-3 fatty acids, further expands their application. As consumer preference shifts towards convenient and palatable health supplements, fortified gummies are likely to play a significant role in preventive healthcare (23)

VIII. CONCLUSION

In conclusion, food fortification remains an effective strategy to address micronutrient deficiencies and improve public health outcomes. Fortified gummies represent a modern and innovative extension of this approach, combining nutritional benefits with improved palatability and compliance. They offer a versatile platform for delivering essential nutrients, including vitamins, minerals, probiotics, and herbal components. Despite certain limitations such as sugar content and stability concerns, their advantages make them a widely accepted dosage form among different population groups. With continued research and technological advancements, fortified gummies have the potential to become a reliable and accessible solution for managing nutritional deficiencies. Their suitability for children, vegetarians, and working individuals further highlights their practical significance in today's lifestyle.

REFERENCES

- [1] Khadri, Fathima & K, Kulkarni & Venkatesh, Venkatesh & joshi, Hanumanthachar. (2025). Science and Challenges in Formulating Gummies as a Novel Oral Dosage Form: A Review. *GSC Biological and Pharmaceutical Sciences*. 33. 298-307. 10.30574/gscbps.2025.33.3.0521.
- [2] Asan, Şeyma & Özakar, Emrah & Sevinç Özakar, Rukiye. (2025). Gummies and gel tablets: New approaches to oral drug delivery. *Journal of Research in Pharmacy*. 29. 1301-1317. 10.12991/jrespharm.1712386.
- [3] Gültekin, Hazal Ezgi & İlhan, Miray & NALBANTOĞLU, Fırat. (2024). A new approach to oral dosage forms: carrageenan-based vegan gummies. *Journal of Research in Pharmacy*. 28(1). 225-235. 10.29228/jrp.690.
- [4] Patel, Himanshu. (2024). Comparative Analysis of Nutritional Supplement Dosage Forms. *Journal of Global Economy, Business and Finance*. 6. 39-45. 10.53469/jgebf.2024.06(12).08.
- [5] Prajapati, Parixit & Sharma, Ragini. (2024). Advances in food fortification: Ensuring a healthier humanity, types, and analytical methods. *Current Trends in Pharmacy and Pharmaceutical Chemistry*. 6. 76-83. 10.18231/j.ctppc.2024.021.
- [6] Prajapati, Parixit & Sharma, Ragini. (2024). Advances in food fortification: Ensuring a healthier humanity, types, and analytical methods. *Current Trends in Pharmacy and Pharmaceutical Chemistry*. 6. 76-83. 10.18231/j.ctppc.2024.021.
- [7] Pankti Ganatra, Lakshmi Jyothish, Vaishnavi Mahankal, Tanvi Sawant, Prajakta Dandekar, Ratnesh Jain, Drug-loaded vegan gummies for personalized dosing of simethicone: A feasibility study of semi-solid extrusion-based 3D printing of pectin-based low-calorie drug gummies, *International Journal of Pharmaceutics*, Volume 651, 2024, 123777
- [8] Man, Yaxing & Xu, Tiantian & Adhikari, Benu & Zhou, Cunshan & Wang, Yuchuan & Wang, Bo. (2021). Iron supplementation and iron-fortified foods: a review. *Critical Reviews in Food Science and Nutrition*. 62. 1-22. 10.1080/10408398.2021.1876623.
- [9] Huma, Nuzhat & Rehman, Salim-ur & Anjum, Faqir & Murtaza, Mian Anjum & Sheikh, Munir. (2007). Food Fortification Strategy— Preventing Iron Deficiency Anemia: A Review. *Critical reviews in food science and nutrition*. 47. 259-65. 10.1080/10408390600698262.
- [10] Neyrinck, A. M., Nazare, J.-A., Rodriguez, J., Jottard, R., Dib, S., Sothier, M., Berghe, L. V. D., Alligier, M., Alexiou, H., Maquet, V., Vinoy, S., Bischoff, S. C., Walter, J., Laville, M., & Delzenne, N. M. (2020). Development of a Repertoire and a Food Frequency Questionnaire for Estimating Dietary Fiber Intake Considering Prebiotics: Input from the FiberTAG Project. *Nutrients*, 12(9), 2824.
- [11] Cormick, Gabriela & Betran, Ana & Romero, Iris & Cormick, Maria & Belizán, José & Bardach, Ariel & Ciapponi, Agustín. (2021). Effect of Calcium Fortified Foods on Health Outcomes: A Systematic Review and Meta-Analysis. *Nutrients*. 13. 316. 10.3390/nu13020316.
- [12] Roohani N, Hurrell R, Kelishadi R, Schulin R. Zinc and its importance for human health: An integrative review. *J Res Med Sci* 2013 Feb;18(2):144-57. PMID: 23914218; PMCID: PMC3724376.
- [13] Alsanie SA (2026) Probiotic-fortified functional foods: integrating nutrient delivery and gut health benefits. *Front. Nutr.* 13:1815558. doi: 10.3389/fnut.2026.1815558
- [14] Khune, Amit & Rathod, Harishkumar & Deshmukh, Swati. (2024). Development of herbal medicated gummies for nicotine cessation support. *GSC Biological and Pharmaceutical Sciences*. 28. 084-089. 10.30574/gscbps.2024.28.2.0213.
- [15] Asan, Şeyma & Özakar, Emrah & Sevinç Özakar, Rukiye. (2025). Gummies and gel tablets: New approaches to oral drug delivery. *Journal of Research in Pharmacy*. 29. 1301-1317. 10.12991/jrespharm.1712386.
- [16] Grujović, M. Ž., Smedo-Lemsaddek, T., & Marković, K. G. (2025). Application of Probiotics in Foods: A Comprehensive Review of Benefits, Challenges, and Future Perspectives. *Foods*, 14(17), 3088.
- [17] Vidhi Patel, Pradip Kumawat, Hitesh Prajapati, Darshil Dave and Amrit Prajapat. Formulation and evaluation of medicated gummies. *J Pharmacogn Phytochem* 2025;14(4):480-485.



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- [18] Jagveer Singh, Amrita Poonia, Vasundhara Rao, Profiling of bioactive compounds identified in functional gummies by metabolomics analysis using High-Resolution Accurate Mass-Spectrometry, *Food and Humanity*, Volume 3, 2024, 100327,
- [19] Pankti Ganatra, Lakshmi Jyothish, Vaishnavi Mahankal, Tanvi Sawant, Prajakta Dandekar, Ratnesh Jain, Drug-loaded vegan gummies for personalized dosing of simethicone: A feasibility study of semi-solid extrusion-based 3D printing of pectin-based low-calorie drug gummies, *International Journal of Pharmaceutics*, Volume 651, 2024, 123777,
- [20] Grujović, M. Ž., Semedo-Lemsaddek, T., & Marković, K. G. (2025). Application of Probiotics in Foods: A Comprehensive Review of Benefits, Challenges, and Future Perspectives. *Foods*, *14*(17), 3088.
- [21] Anwer, M., Wei, M.Q. Harnessing the power of probiotic strains in functional foods: nutritive, therapeutic, and next-generation challenges. *Food Sci Biotechnol* **33**, 2081–2095 (2024).
- [22] Tikuneh, A.H., Bogale, E.K., Beyene, G.A. *et al.* The role of probiotics and probiotic fortified products supplementation in improving nutritional outcomes in children under 5 with acute malnutrition: a systematic review and meta-analysis of randomized, controlled trials protocol. *Syst Rev* **15**, 8 (2026).