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FOOD PROCESSING

Towards Sustainable Growth Opportunities

EXPLORING NUTRACEUTICALS

Health Benefits and Market Trends

EXPLORING NUTRACEUTICALS

HEALTH BENEFITS AND MARKET TRENDS

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ABSTRACT

This focus paper delves into the fascinating world of nutraceuticals, which are food-derived products that go beyond basic nutrition and offer potential health benefits. Nutraceuticals have gained popularity as consumers increasingly seek to improve their overall well-being and prevent or manage diseases.

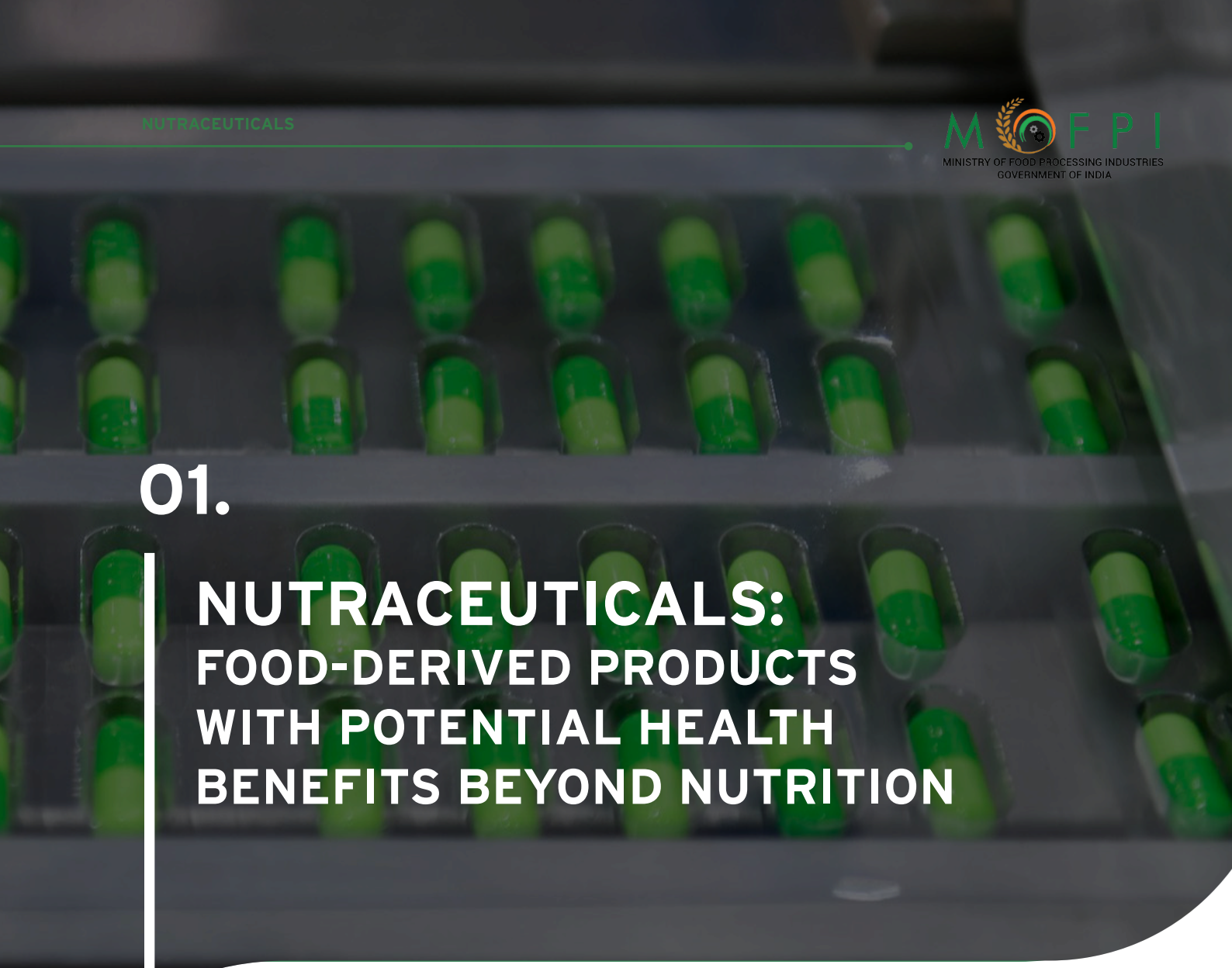
The paper begins by providing an overview of nutraceuticals, explaining their classification and exploring the history of their development. It highlights the distinction between nutraceuticals and dietary supplements, emphasizing that nutraceuticals are designed to provide additional health benefits beyond basic nutritional supplementation.

One of the key focuses of the paper is the advantages of nutraceuticals for health and wellness. Nutraceuticals have been found to have a positive impact on various health concerns, including obesity, heart disease, type 2 diabetes, and cancer. They possess properties such as anti-cancer, anti-inflammatory, anti-lipid, antioxidant, and anti-allergen effects, making them valuable in supporting overall health and disease prevention.

The regulatory framework for nutraceuticals in India, governed by the Food Safety and Standards Authority of India (FSSAI), is explored in detail. The paper discusses the scope of nutraceuticals, the allowed nutrients and ingredients, usage levels, delivery formats, and additives. Compliance with these regulations ensures consumer safety and product quality.

Furthermore, the paper examines the market trends and opportunities in the nutraceutical industry, both globally and in India. It highlights the significant growth potential of the Indian nutraceutical market, which is projected to reach billions of dollars in value. The ongoing pandemic and the growing emphasis on preventive healthcare have contributed to the rapid expansion of this sector. The paper emphasizes the increased consumer demand for immune-boosting supplements and the changing purchasing habits, with a preference for flexible dosage forms.

Finally, the paper underscores the importance of ongoing research, adherence to regulations, and innovative marketing strategies for the success and expansion of the nutraceutical market in India. The nutraceutical industry presents promising opportunities for manufacturers and marketers to cater to the growing demand for products that support overall well-being and preventive healthcare.



01.

NUTRACEUTICALS: FOOD-DERIVED PRODUCTS WITH POTENTIAL HEALTH BENEFITS BEYOND NUTRITION

Nutraceuticals represent a class of products that originate from food sources and are marketed for their putative health-promoting effects, which surpass their basic nutritional value. These products are available in various forms, including supplements, fortified foods, or beverages, and may comprise natural or synthetic compounds, such as vitamins, minerals, and herbal extracts, that are believed to confer health benefits. Nutraceuticals have gained popularity due to their potential to support and maintain human health and prevent or treat diseases[1].

As per the Food Safety Standard Authority of India, Nutraceuticals encompass a class of food products comprising of extracts, isolates, and purified chemical compounds that offer physiological advantages and contribute to the preservation of overall well-being. The primary purpose of nutraceuticals is to confer physiological advantages and contribute to the maintenance of optimal health, without the intention of treating or curing any specific medical condition, disease, or disorder[2].

[1] Brower, V. Nutraceuticals: Poised for a healthy slice of the healthcare market, https://doi.org/10.1038/nbt0898-728.
[2] Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, and Prebiotic and Probiotic Food) Regulations, 2022. [FSSAI (Nutra) Regulations, 2022]

Notable examples of nutraceuticals include omega-3 fatty acids, probiotics, antioxidants like vitamins C and E, and herbal supplements like ginkgo biloba and echinacea, which have been widely studied for their health benefits. Nutraceuticals are often promoted as natural and safe alternatives to prescription drugs for the management of various health conditions, such as joint pain, cognitive decline, and cardiovascular disease, which can be attractive to consumers who seek to avoid potential side effects or drug interactions. However, the effectiveness and safety of nutraceuticals remain a subject of ongoing research and debate among healthcare professionals and researchers.

Nutraceuticals can be distinguished from dietary supplements by the following characteristics[3]:

1.1

Nutraceuticals are intended to offer more than just supplementary nutritional value. Nutraceuticals are expected to have potential preventive or therapeutic benefits against disease. While dietary supplements are used to supplement or enhance dietary intake, nutraceuticals are designed to provide additional health benefits beyond nutritional supplementation.

1.2

Nutraceuticals can be incorporated into conventional meals or serve as a complete dietary component on their own. Nutraceuticals are essential food constituents that provide nutritional benefits as well as medicinal effects. The benefits of these foods are due to the presence of active compounds such as carotenoids, collagen hydrolysate, and dietary fibres. They have been found to positively affect cardiovascular and immune system health and have a role in infection and cancer prevention[4].

[3] Food Processing Industry in India,
[4] Kalra, E.K. Nutraceutical-definition and introduction. AAPS PharmSci 5, 25 (2003)

02.

HISTORY OF NUTRACEUTICALS:

The term "nutraceuticals" was first coined by Stephen DeFelice, who is the Chairman and Founder of the Foundation for Innovation in Medicine located in Cranford, New Jersey[5]. In 1989, he used this term to refer to food or food components that provide medical or health benefits beyond basic nutritional value, including disease prevention and/or treatment. Essentially, nutraceuticals are a combination of the words "nutrition" and "pharmaceuticals", indicating that they are products derived from food that can be used to prevent or treat health conditions. DeFelice's definition of nutraceuticals has been widely adopted and is still in use today.

[5] Ramaa CS, Shirode AR, Mundada AS, Kadam VJ. Nutraceuticals--an emerging era in the treatment and prevention of cardiovascular diseases. https://pubmed.ncbi.nlm.nih.gov/16472130/

03.

CLASSIFICATION OF NUTRACEUTICALS

Nutraceuticals encompass a wide range of products that are derived from food sources and offer potential health benefits beyond basic nutrition. These include functional foods, Carotenoids, Collagen hydrolysate, probiotics, and more[6].

FUNCTIONAL FOODS:
contain antioxidant compounds that help prevent diabetes, in addition to providing us with nutrients[7].

CARETINOIDS:
Pigmented compounds such as α-carotene, β-carotene, and β-cryptoxanthin have antioxidant and anti-inflammatory properties. They are used to improve vision, prevent cancer, and strengthen the immune system[8].

[6] Waqas, Syed & Akram, Muhammad & Panda, Ashok & Elbossaty, Walaa & Hegazil, Ahmed & Ghasemian, Abdolmajid & Aharwal, Ravindra & Chelladurai, G & Mandal, Sudip & Hadji, El & Mbaye, El Hadji Seydou & Wiwanitkit, Viroj. (2022). Current trends and future prospect of medicinal plants derived nutraceuticals: A review. 10.18231/j.ctppc.2022.006.
[7] Asif M. The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern. J Educ Health Promot. 2014
[8] Bhatt T, Carotenoids PK. Potent to Prevent Diseases Review. Nat Prod Bioprospect

COLLAGEN HYDROLYSATE:
It is secreted from skin, bone, cartilage, and tendons and is the most important human protein. It has multiple medicinal properties[9].

DIETARY FIBRE:
non-starchy, poorly digestible vegetable carbohydrates are found in vegetables, fruits, wheat bran, and oats. Diets rich in fibre have a positive effect on the digestive system and can reduce Crohn's disease and ulcerative colitis[10].

FATTY ACIDS
the building blocks of the fat in our bodies and in the food we eat. They have biological activities that act to influence cell and tissue metabolism, function, and responsiveness to hormonal and other signals[11].

PHYTOCHEMICALS
Active compounds that work on balance inside the body and nervous activity can decrease cancer. Lutein and lycopene are two of the most important of these compounds[12].

HERBS
Plants that do not have a wooden bowl are called non-woody plants. These plants have antioxidant properties. For example, garlic extracts and ginger are used in the treatment of cholesterol, wound healing, and anti-ulcer[13].

PROBIOTICS
Microbes are considered to have many uses in the medical field and human health. They are found in milk products and have antioxidant properties. They also regulate the movement of the digestive system and work to regulate the growth of gut microbiota[14].

[9] Wang Z, Liu H, Luo W. Regeneration of skeletal system with genipin crosslinked biomaterials.
[10] Dhingra D, Michael M, Rajput H, Patil RT. Dietary fibre in foods: a review. J Food Sci Technol.
[11] Kuijpers MC, Dijkstra G. Food and Food Groups in Inflammatory Bowel Disease (IBD): The Design of the Groningen AntiInflammatory Diet (GrAID). Nutrients. 2021;13(4):1067.
[12] Tan BL, Norhaizan ME, Liew WP, Rahman S. Antioxidant and Oxidative Stress: A Mutual Interplay in Age-Related Diseases. Front Pharmacol. 2018;9:1162. doi:10.3389/fphar.2018.01162.
[13] Markowiak P, Sli ´ zewska K. Effects of Probiotics, Prebiotics, ˙and Synbiotics on Human Health. Nutrients. 2017;9(9):1021.
[14] Dietary Supplements Market Size & Trends Report; 2021. Available from: https://www.grandviewresearch.com/industry-analysis/dietarysupplements-market.

CLASSIFICATION OF NUTRACEUTICALS[15]

DIETARY SUPPLEMENTS

Dietary supplements are orally ingested products containing a dietary ingredient. intended to complement the diet. These supplements serve specific purposes such as sports nutrition, weight loss, and meal replacement, and may include ingredients such as vitamins, minerals, herbs, amino acids, enzymes, organ tissues, gland extracts, or other dietary substances.

NUTRIENTS

Bioactive compounds with established nutritional roles, including vitamins, minerals, amino acids, and fatty acids, and their associated health benefits.

[15] Syed Waqas1, Muhammad Akram2, Ashok Kumar Panda3, Walaa Fikry Elbossaty4, Ahmed G. Hegazil5, A bdolmajid Ghasemian6, Ravindra Prasad Aharwal7, G. Chelladurai8,*, Sudip Kumar Mandal9, El Hadji Seydou Mbaye10, Viroj Wiwanitkit11; Current trends and future prospect of medicinal plants derived nutraceuticals: A review

[16] Brunso K, Fjord TA and Grunert KG. Consumers' food choice and quality perception

Table 1: List of nutrients and their relevance[16]

Nutrients	Health Benefits
Vitamin A	Antioxidant, essential, for growth and development and in the treatment of certain skin disorders
Vitamin E	Antioxidant helps form blood cells, muscles, lung and nerve tissue, boosts the immune system
Vitamin K	Essential for blood clotting
Vitamin D	helps the body absorb and retain calcium and phosphorus
Vitamin B1	Helps to convert food into energy, essential in neurologic functions.
Vitamin B2	Helps in energy production and other chemical processes in the body
Vitamin B3	helps lower cholesterol and boost brain function
Vitamin B5	necessary for making blood cells
Vitamin B12	essential for the synthesis of neurotransmitters
Vitamin C	Antioxidant, for healthy bones, gums, teeth, and skin, in wound healing, preventing common cold and attenuating its symptoms.

04.

EXPLORING THE ADVANTAGES OF NUTRACEUTICALS FOR HEALTH AND WELLNESS

Nutraceuticals are believed to contribute to human health by slowing down the ageing process and reducing the risk of chronic illnesses, thereby potentially extending lifespan. These supplements have been shown to have a beneficial impact on various health concerns, including obesity, heart disease, type 2 diabetes, and cancer. Nutraceuticals also possess properties that exhibit anti-cancer, anti-inflammatory, anti-lipid, antioxidant, and anti-allergen effects. Additionally, they have been found to have positive effects on the prevention and management of conditions such as Alzheimer's disease and cardiovascular disease[17].

Enhancing Nutraceutical Stability and Functionality through Encapsulation:

The process of encapsulating nutraceuticals involves enclosing these compounds within capsules or matrices to safeguard them and enhance their stability.

Multiple techniques, including extrusion, emulsion, coacervation, lyophilization, and spray drying, can be employed for encapsulation. This encapsulation process offers several advantages, such as improved bioavailability, controlled release, and enhanced functionality of nutraceuticals in food products. Capsules made from various encapsulating materials, such as biopolymers, are used to protect nutraceuticals. Extensive research has been conducted on encapsulated nutraceuticals, and there are numerous reviews available that delve into different encapsulation technologies and materials. The encapsulation of nutraceutical compounds is especially significant in the realm of developing functional foods, which aim to provide health benefits beyond basic nutrition[18].

[17] Syed Waqas1, Muhammad Akram2, Ashok Kumar Panda3, Walaa Fikry Elbossaty4, Ahmed G. Hegazil5, A bdolmajid Ghasemian6, Ravindra Prasad Aharwal7, G. Chelladurai8,*, Sudip Kumar Mandal9, El Hadji Seydou Mbaye10, Viroj Wiwanitkit11, Current trends and future prospect of medicinal plants derived nutraceuticals: A review

[18] Priscilla Magro Reque, Adriano Brandelli, Encapsulation of probiotics and nutraceuticals: Applications in functional food industry, Trends in Food Science & Technology, Volume 114, 2021

05.

TRADITIONAL AND NON - TRADITIONAL NUTRACEUTICALS

A diverse range of nutraceutical foods are available in the market, comprising both conventional and non-traditional food categories

5.1 TRADITIONAL NUTRACEUTICALS:
Within the traditional Nutraceuticals category, natural whole foods are included without any modifications, accompanied by novel information on their potential health benefits.

5.2 NONTRADITIONAL NUTRACEUTICALS:
Nontraditional nutraceuticals are products resulting from agricultural breeding or fortified with additional nutrients and/or ingredients, such as calcium-fortified orange juice, vitamin- or mineral-added cereals, and folic acid-enriched flour.

06.

REGULATORY FRAMEWORK FOR NUTRACEUTICALS: FSSAI GUIDELINES AND COMPLIANCE

6.1

Scope: Nutraceuticals are designed to elicit favourable physiological effects and support the maintenance of overall health, with a focus on not serving as therapeutic interventions or remedies for specific medical conditions, diseases, or disorders..

6.2

N**utrients/Ingredients allowed:** The molecules, isolates, and extracts derived from substances listed under Schedule III of Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, and Prebiotic and Probiotic Food) Regulations, 2022. [FSSAI (Nutra) Regulations, 2022], as determined by the Food Authority and subject to periodic updates. Furthermore, the inclusion of nutrients and ingredients sourced from other schedules, approved, and specified by the Food Authority on a discretionary basis.

6.3

Nutrients/Ingredients usage Level:

6.3.1

Ingredients: The limits are outlined in Schedule III, focusing on the standardization of marker compounds and the daily usage levels specified within the schedule. If specific daily minimum and maximum usage levels are not provided, the Food Business Operator (FBO) will determine appropriate usage levels based on pertinent scientific data, while maintaining documentary evidence of the supporting data. For ingredients lacking standardized marker compounds, compliance will be based on manufacturer specifications, quality requirements, and purity criteria as stipulated in regulations. The FBO will be responsible for submitting relevant data to the Food Authority upon request.

6.3.2

Nutrients: The usage levels must not exceed the limits set by the Food Authority. If the Food Authority does not provide specific limits, the minimum usage level shall be at least 15% of the Recommended Daily Allowance (RDA) specified by the Indian Council of Medical Research (ICMR) in cases where a nutrient content claim is being made. However, if a claim is made regarding higher nutrient content, the nutrient content must not be lower than 30% of the recommended daily allowance and should not exceed one RDA in any case. If there are no specific standards in place, the standards established by the international food standards body, the Codex Alimentarius Commission, shall be applied.

6.4

Delivery format(s): The Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, and Prebiotic and Probiotic Food) Regulations, 2022, known as the FSSAI (Nutra) Regulations, 2022, outline the general requirements that must be followed.

6.5

Additives:

6.5.1

Regarding products in tablet, capsule, pill, or liquid format, only additives approved by the FA (Food Authority) at the given time are permitted.

6.5.2

For products that do not fall under the tablet, capsule, pill, or liquid format, only additives within the specified limits permitted for category 13.6 and the GMP table mentioned in Appendix 'A' of the FSS (Food Safety and Standards) Regulations, 2011, are allowed.

6.6

Labelling requirement(s): The FSSAI (Nutra) Regulations, 2022, commonly referred to as the Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, and Prebiotic and Probiotic Food) Regulations, 2022, provide a comprehensive set of guidelines that establish the essential obligations to be adhered to[19].

[19] Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, and Prebiotic and Probiotic Food) Regulations, 2022. [FSSAI (Nutra) Regulations, 2022]

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07.

INDUSTRY INSIGHT:
ANALYZING THE NUTRACEUTICAL MARKET TRENDS AND OPPORTUNITIES

There has been a notable change in consumer behaviour and market trends in India due to the increased trust in immune-boosting supplements among the population. Flexible dosage forms, such as vitamin capsules, chewable tablets, and gummies, exemplify this open-minded buying behaviour towards healthcare products. The ongoing pandemic and the growing emphasis on preventive healthcare have contributed to the substantial growth of this sector.

7.1

India's nutraceuticals market, currently valued at $4-5 billion in terms of sales, is poised to take the lead globally, with projected growth of over $18 billion by 2025[20].

7.2

According to research, the Indian dietary supplement sales market was valued at USD 3924.44 million in 2020, and it is projected to grow at an annual expansion rate of 22%, reaching USD 10,198.57 million by 2026[21].

[20] https://foodprocessingindia.gov.in/newsletter/emailer/two
[21] Ibid

08.

GLOBAL NUTRACEUTICAL MARKET ANALYSIS:
CURRENT STATUS, GROWTH POTENTIAL, AND MARKET TRENDS IN INDIA

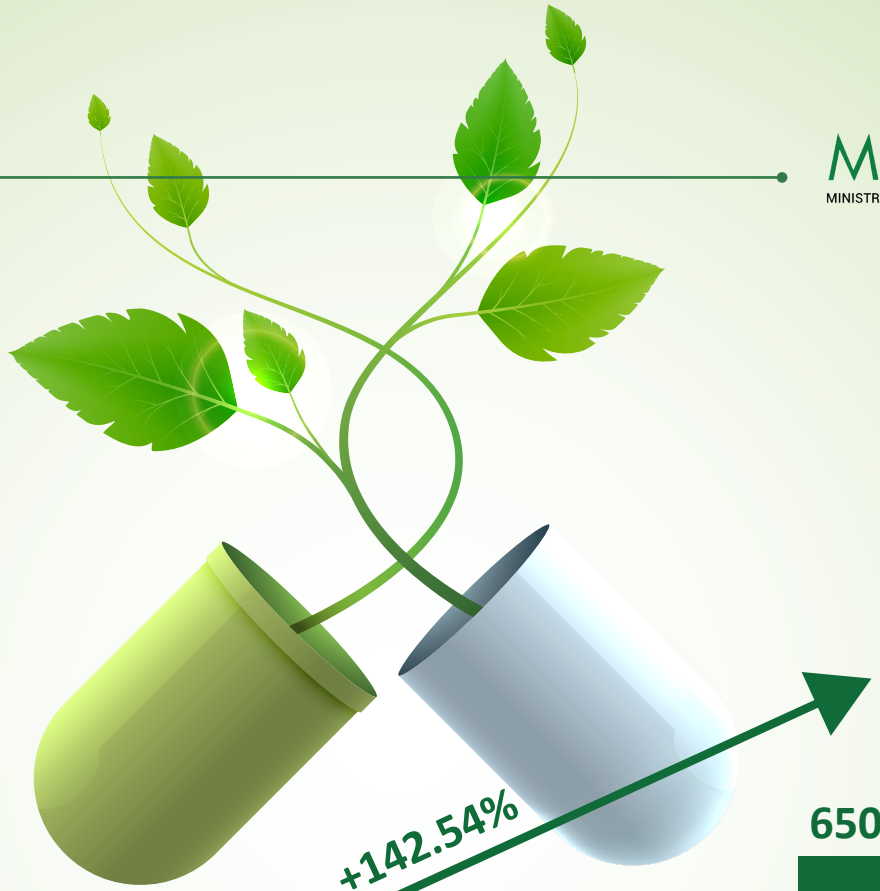
The global nutraceutical market in terms of sales is dominated by the USA, Japan, and Europe, accounting for 90% of the global market. The market is projected to grow at a compound annual growth rate (CAGR) of 7%, expanding from USD 247 billion in 2019 to USD 336 billion by 2024 on a global scale[22].

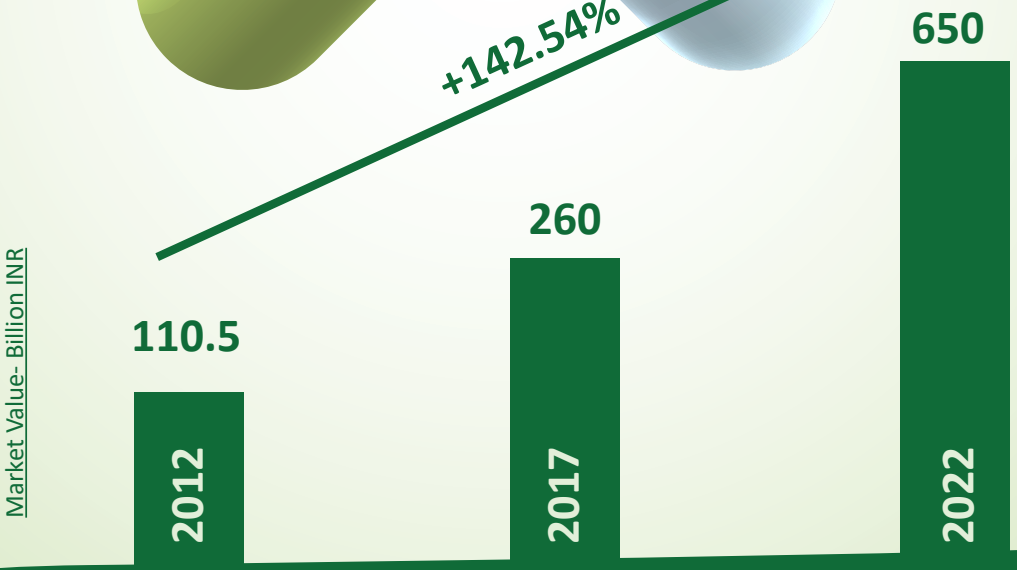
8.1
In 2017, the Indian nutraceutical market accounted for a mere 2% of the global market share, but by 2019, its value had significantly increased. The market experienced substantial growth and is projected to continue thriving with a compound annual growth rate (CAGR) of 21%. As a result, it is expected to reach a noteworthy milestone of USD 11 billion by the end of 2023[23].

8.2
By the end of 2023, it is expected that the Indian market will account for a minimum of 3.5% of the global nutraceutical market[24].

8.3
In the fiscal year 2020, India's pharmaceutical exports amounted to USD 16.3 billion, and as of November 2020, the exports were valued at USD 15.86 billion. In FY20 and October 2020, the exports of pharmaceuticals were recorded as USD 2.07 billion and USD 16.28 billion, respectively[25].

[22] https://foodprocessingindia.gov.in/sectors/Nutraceuticals
[23] https://foodprocessingindia.gov.in/newsletter/emailer/two
[24] Ibid
[25] Ibid





Indian Nutraceutical Market Stats

Currently, the Indian nutraceutical market imports nutraceuticals worth USD 2.7 billion, while its export value stands at USD 1.5 billion. However, the market had grown at a remarkable CAGR of 22% by 2023[26].

The Indian nutraceuticals market experienced a growth rate of 25% annually amid the pandemic. Moreover, the FDI in the sector has increased from USD 131.4 million in FY12 to USD 584.7 million in FY19[27].

[26] Ibid
[27] Ibid

09. CONCLUSION

India's urban population's growing concern for physical well-being and nutrient deficiencies presents a significant opportunity for expansion in the nutraceuticals industry. As a result, the industry is expected to experience rapid growth, and manufacturers and marketers of nutraceuticals are developing innovative strategies to inform consumers about product benefits for medical treatment and preventative healthcare. Additionally, players in the industry are launching initiatives to ensure higher product quality standards, increased transparency, and competitive pricing for innovations. This will help Nutraceuticals gain ground in the health and wellness market, which already controls 67% of the supplement business dominated by the pharmaceutical industry[28].

The nutraceutical supplements market in India is anticipated to exhibit a compounded annual growth rate (CAGR) of approximately 20 per cent from 2015 to 2023, with the herbal segment expected to account for around 30 per cent of this growth[29].

In recent years, this particular industry has experienced notable growth, which has been further accelerated by the ongoing pandemic. The increased emphasis on preventive healthcare has played a significant role in driving the expansion of this sector. Throughout India, there has been a growing acceptance of immunity-boosting supplements, leading to a substantial change in consumer purchasing habits and market dynamics. Consumers of healthcare products have shown an open-minded approach by favouring items such as vitamin capsules, chewable tablets, and gummies. Additionally, doctors commonly prescribe vitamin and zinc supplements, further propelling the growth of the nutraceutical market in India.

[28] Ibid
[29] https://foodprocessingindia.gov.in/sectors/Nutraceuticals

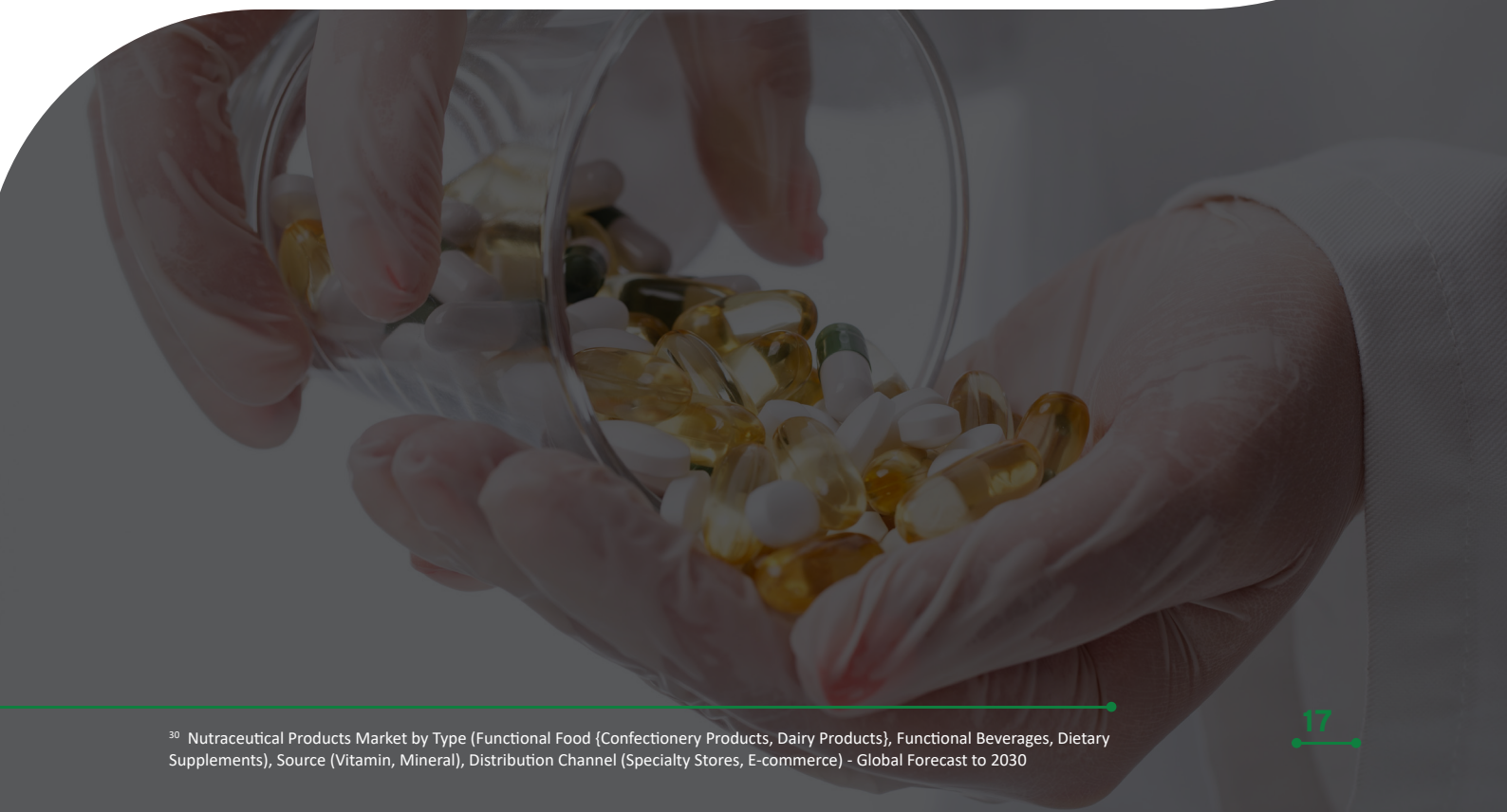
Amidst the pandemic, preventive healthcare has emerged as a crucial defence strategy, highlighting the nutraceuticals sector's strong economic partnership with the population. Even as the pandemic's severity has diminished, the preference for nutraceuticals has persisted.

There has been a notable increase in the importance of essential vitamins, plant-based proteins, vegan Omega-3, sea minerals like calcium and magnesium, fibres like fenugreek, probiotics, black garlic, and amino acids, in the daily lifestyles of people. This trend has been accompanied by improved accessibility of nutraceuticals in all

9. Nutraceutical Industry: Current Developments and Future Outlook

regions of India, resulting in significant growth through both Business-to-Consumer (B2C) and Direct-to-consumer (D2C) channels.

The nutraceutical products market is segmented based on distribution channels, including supermarkets & hypermarkets, convenience stores, speciality stores, pharmacies & drug stores, e-commerce, and other channels. By 2023, the supermarkets & hypermarkets segment is projected to dominate the nutraceutical products market. This segment's significant market share can be attributed to various factors such as accelerated urbanization, growing per capita disposable incomes, consumers' growing preference for healthy eating habits, and increased sales of functional food and beverages in established supermarkets and hypermarkets[30].



[30] Nutraceutical Products Market by Type (Functional Food {Confectionery Products, Dairy Products}, Functional Beverages, Dietary Supplements), Source (Vitamin, Mineral), Distribution Channel (Specialty Stores, E-commerce) - Global Forecast to 2030

10. CONCLUSION

The nutraceutical industry in India is experiencing significant growth and presents a promising market opportunity. Nutraceuticals, which are food-derived products with potential health benefits beyond basic nutrition, have gained popularity among consumers seeking to support their overall well-being and prevent or treat diseases. India's nutraceutical market has witnessed remarkable growth, with projections indicating further expansion in the coming years.

The Indian nutraceutical market, once accounting for only 2% of the global market share in 2017, saw substantial growth and reached a value of approximately $4-5 billion by 2019. Projections suggest that the market will continue to thrive with a compound annual growth rate (CAGR) of 21%, aiming to reach a significant milestone of $11 billion by the end of 2023. Furthermore, it is expected that by 2025, India's nutraceutical market will become a global leader, with projected growth exceeding $18 billion.

The advantages of nutraceuticals for health and wellness have been extensively studied, showcasing their potential to slow down ageing, reduce the risk of chronic illnesses, and positively impact various health concerns such as obesity, heart disease, type 2 diabetes, and cancer. Nutraceuticals offer properties such as anti-cancer, anti-inflammatory, anti-lipid, antioxidant, and anti-allergen effects. However, the effectiveness and safety of nutraceuticals continue to be subjects of ongoing research and debate.

The regulatory framework for nutraceuticals in India, governed by the Food Safety and Standards Authority of India (FSSAI), outlines guidelines for the usage of ingredients, additives, labelling requirements, and delivery formats. Compliance with these regulations ensures consumer safety and product quality.

With an increasing emphasis on preventive healthcare and the rising popularity of immune-boosting supplements, the nutraceutical market in India has witnessed a shift in consumer behaviour. There is a growing demand for flexible dosage forms and a preference for healthcare products that offer both nutritional and medicinal benefits. Supermarkets and hypermarkets are projected to dominate the distribution of nutraceutical products, driven by factors such as urbanization, rising disposable incomes, and consumers' adoption of healthy eating habits.

In conclusion, the nutraceutical industry in India is poised for continued growth, fueled by consumer demand for products that support overall well-being and preventive healthcare. Ongoing research, adherence to regulatory guidelines, and innovative marketing strategies will contribute to the success and expansion of the nutraceutical market in India.

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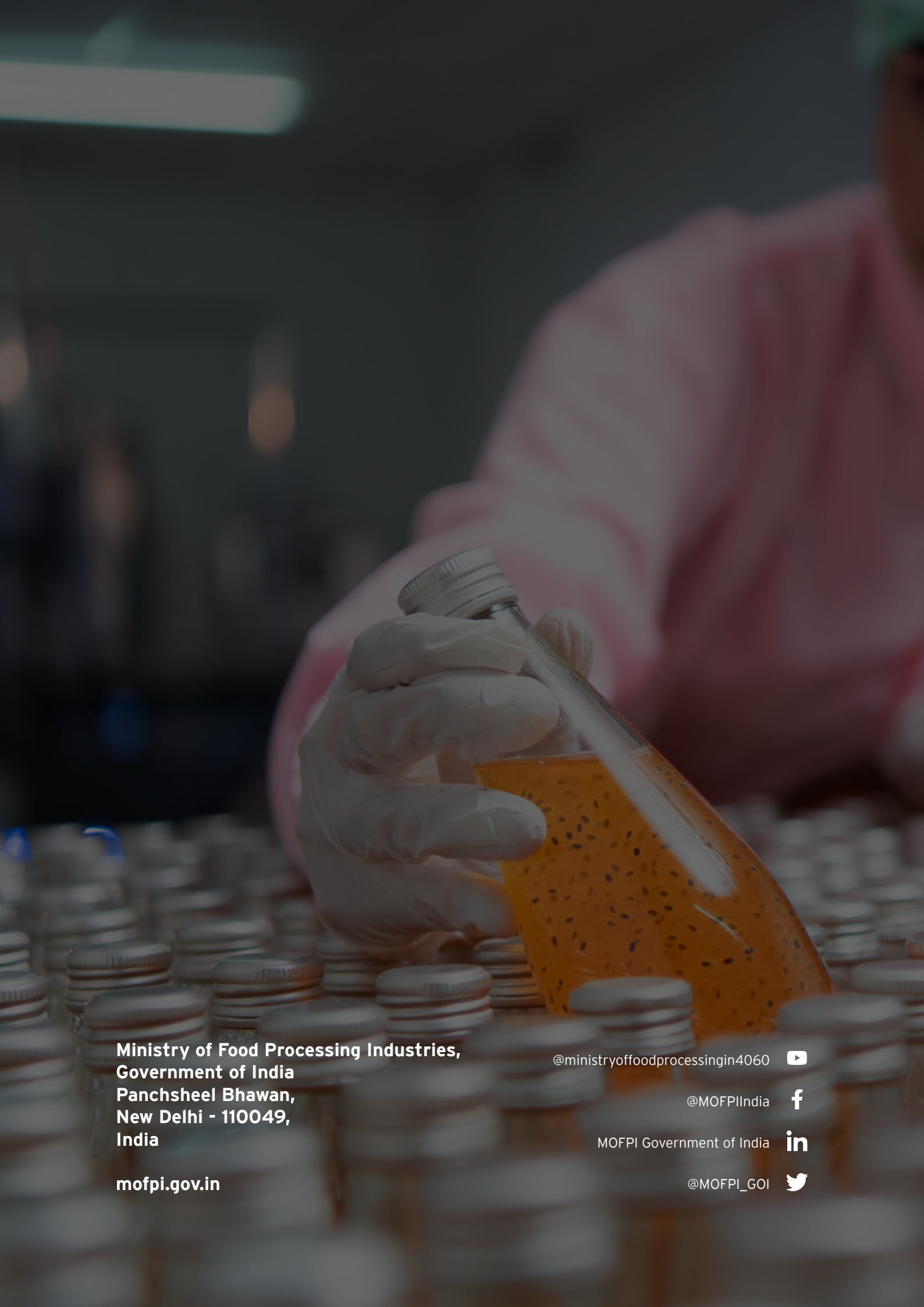

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