

Nutraceutical: A Review On; Basic Requirement, Classification, Recent Trends in Industry and Delivery System

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ABSTRACT

Nutraceuticals are any substance, i.e. Food or part of food used for nutritional purposes and provided medical and health benefits. In today's scenario nutraceutical supplements are used as an alternative to pharmaceutical medicine and the physician also preferred nutraceutical supplements in various lifethreatening diseases like hypertension, diabetes mellitus, gastrointestinal diseases, etc. The evolution of the nutraceutical industry in recent years because of certain things or trends emerging and gaining popularity all over the world. These trends are the use of cannabis (cannabidiol) in nutraceuticals, nutricosmetics, nutritional supplements for pets, the plastic packaging problem with nutraceutical, sports nutrition supplement, and most important online marketing strategies for nutraceutical product marketing. There are various techniques like spray drying, extrusion is used for formulating nutraceutical products. As the market of nutraceuticals grows all over the globe, the delivery systems also change. In the nutraceutical industry various delivery systems are used like nanoemulsion, nanoparticles, Probiotics, liposomes, and micelles, it gives the targeted delivery of nutritional elements.

Keywords: Nutraceutical, life-threatening, cannabis, nutricosmetics, online marketing, Probiotics, Delivery systems.

I. INTRODUCTION

A nutraceutical is any substance that is a food or part of the food & provides medical and health benefits [35]. Including the prevention & treatment of diseases or the pharmaceutical preserved product used for human wellness & health [4][5]. In today scenario in all over the world, the popularity & the use of nutraceutical supplement increases [20]. People mostly preferred the nutraceutical product instead of medicine because of their high cost and side effects. The people are more aware of their health, immunity

lifestyle (I.L). Therefore, they mostly preferred nutraceutical supplements [36].

They use various emerging trends in the nutraceutical industry like the use of cannabis (cannabidiol) as a nutritional product but they have certain limits on their use [64]. The other trend is nutricosmetics. The market of nutricosmetics is increases all over the globe, this is because the use of nutricosmetics increases for beautification, improves the appearance of the skin, good personality [8][12]. The use of nutricosmetics is highest in the women as compared to the man. But the popularity of men's nutricosmetics has also increased.

Now a day physicians also preferred nutraceutical supplements for various diseases like DM, hypertension, heart diseases, gastrointestinal disease (GERD, improper digestion, gastric ulcer) vitamin deficiency [19] [29] [30] [37]. Therefore, there is a slow transition from pharmaceutical medicine to nutraceutical supplements [33] [36].

The nutraceutical mainly consists of proteins, vitamins, antioxidants, dietary fibers, fatty acid, carbohydrates, amino acid, which help the human to improve the health, gaining energy & boosting the immunity [5] [14].

The other consumer group for the nutraceutical supplement is pets. The pet owner is more cautious about the health of pets. They are one of the most important parts of the NI. The pet owner buys supplements for pet health and wellness [54][56]. The one of the approaches in nutraceutical, the plastic packaging problem, the some of the nutraceutical supplement isn't compatible with the plastic & also the fine plastic packaging creates the negative impact on the environment & because of their slow degradation, harmful effect on the environment, therefore to find an alternative for the plastic is emerging & innovative trend in nutraceutical industry [1][2][60][62]. Nutraceutical supplement is also used in sports as a nutritional product, to gain

energy & stronger the immunity power. Wide range of nutraceutical supplements used in sports. Therefore, the market size of the nutraceutical product is increases and achieves the highest level globally [65].

Now a day, online marketing of nutraceuticals is a very popular trend. There are a different number of strategies use for online marketing like email, social media (Twitter, Facebook, Instagram) etc. Therefore nutraceutical market achieves highest level all over globe.

1.1. Basic requirement

- The human body consist of various organ system for the proper growth of the organ & system, there will be required of nutrient, but some of the people are deficient such nutrients, therefore in such case, we need a nutraceutical supplement [4].
- In various diseases like diabetes mellitus, hypertension, gastrointestinal diseases, anemia [5][16] [17].
- For twinning the energy & boosting the immunity for human wellness & health [4].
- Geriatrics patient (GP) has many health-related problems because they have low immune power [17].
- Maintains the normal physiological function of the body [29].
- In children nutraceutical supplement needs for their growth & development [4].
- It is an alternative for medicine because of the cost of the treatment, medicine & expensive & also have many side effects [23]
- Nutraceutical is also used in obesity, metabolic disorder (M.D), cardiovascular and neurodegenerative diseases [23,31].

II. NUTRACEUTICALS CLASSIFICATION

The classification of nutraceuticals based on food availability. Nutraceuticals are classified as traditional/conventional or no traditional nutraceuticals based on natural food sources (Ruchi, 2017).

1.2. Traditional Nutraceuticals:

Traditional nutraceuticals are manufactured food that has not been altered in any way, and its components are all natural and have the potential to provide health advantages (Srivastava, 2018). Several natural ingredients, such as lycopene in tomatoes, omega-3 fatty acids in salmon, and saponins in soy, are found in a

variety of fruits, vegetables, grains, fish, dairy, and meat diets. Tomatoes and salmon are two foods that researchers have shown to provide health advantages beyond basic nutrition (lycopene and omega-3 fatty acids, correspondingly) (Chintale et al., 2013; Prabu et al., 2012).

These classes are usually derived completely from nature, with no modifications to the original form. Various elements, such as lycopene found in tomatoes, omega-3 fatty acids found in salmon, and saponins found in soy, are available and ingested for a variety of health benefits (Chanda et al., 2019). Chemical components, probiotic microbes, and nutraceutical enzymes are all examples of classic nutraceuticals. Chemical constituents include the following classifications:

1.2.1. Nutrients

Strokes, cataracts, osteoporosis, diabetes, heart disease, and cancer can all be treated with nutrients. Minerals derived from plant, animal, and dairy diets are beneficial in the treatment of osteoporosis and anemia. Omega 3-PUFAs, found in flaxseed and salmon, are potent regulators of the inflammatory process, brain function preservation, and cholesterol accumulation reduction.

1.2.2. Herbals

Herbs, often known as botanical foods, are as old as human civilization and provide a wealth of remedies to treat both acute and chronic illnesses. Several nutraceuticals are found in medicinal herbs of important components, providing a whole storage facility of medicine to treat severe and persistent ailments (Khan et al., 2016; Prabu et al., 2012). Some examples are: Parsley (*Petroselinum crispum*) is a diuretic, carminative, and antipyretic herb that includes flavonoids (apiol and psoralen). Willow bark (*Salix nigra*) contains salicin, an anti-inflammatory, analgesic, antipyretic, astringent, and antiarthritic active component. Lavender (*Lavendula Angustifolia*) contains tannins, which aids in the treatment of depression and anxiety (Borkar et al., 2015).

1.2.3. Phytochemicals:

Non-nutritive plant compounds with defensive or disease-protective capabilities are known as phytochemicals. They are nonessential nutrients that plants make primarily to protect themselves. Phytochemicals obtained from plants are used in the diet and give health advantages such as Substrate for biochemical reactions, enzymatic

reaction cofactors, enzyme inhibitors, enzyme intestinal absorbents that bind to and remove unwanted constituents and enhance the absorption and/or stability of important nutrients by scavenging reactive or harmful molecules. Phytonutrients/phytochemicals are found in a wide range of foods, including whole grains, beans, fruits, vegetables, and herbs. These phytochemicals, alone or in combination, have enormous therapeutic promise in the treatment of a variety of illnesses (Prakash et al., 2012; Patil et al., 2016).

Glucose and insulin regulation are important characteristics of phytochemicals, and there is a promising reconsideration of traditional diabetes treatment. Mushrooms' nourishing, tonic, and restorative powers have long been recognized, as have their therapeutic capabilities such as anticancer, antiviral, and hypolipidemic properties. Lentinan boosts the immune system's ability to fight infections caused by bacteria, fungi, parasites, and viruses, including the AIDS virus (Rajam et al., 2019).

1.2.4. Probiotic microorganisms

Probiotics are live bacteria that are given to the host in sufficient quantity to provide a health benefit. They exist in powder, liquid, gel, paste, or granule form, as well as capsule form, and are commonly used to treat gastrointestinal (GI) disorders such as lactose intolerance, acute diarrhea, and antibiotic-related gastrointestinal side effects (Jain, 2020).

Lactobacillus and Bifidobacterium species are the most commonly utilized probiotics, however the yeast *S. cerevisiae*, as well as several *E. coli* and *Bacillus* species are also used (Daneshniya et al., 2020). Lactic acid bacteria, such as *Lactobacillus* species, which have been used for thousands of years to preserve food through fermentation, can serve a dual purpose by acting as agents for food fermentation and having the potential to impact health profits (Guarner et al., 2011).

Probiotic treatment has a variety of important effects, including improving intestinal wellbeing through microbiota guidance, relaxing and improving the immune system, delivering and expanding the bioavailability of supplements, reducing the side effects of lactose influence, and decreasing the risk of various illnesses (Nagpal et al., 2012).

1.2.5. Nutraceuticals Enzyme

Enzymes are essential components of life; without them, our bodies would not function correctly. Anyone suffering from digestive issues such as hypoglycemia, blood sugar abnormalities, or obesity might alleviate their symptoms by adding enzyme supplements to their diet obtained from microbial, plant, and animal sources (Singh and Sinha 2012).

1.3. Non-traditional Nutraceuticals

Non-traditional nutraceuticals are obtained from agricultural breeding by adding nutrients and/or ingredients, such as calcium-fortified orange juice, vitamin- and mineral-fortified cereals, and folic acid-fortified flour. Agricultural experts have successfully developed strategies to increase a crop's nutritional content (Singh and Sinha 2012). They are further subdivided into recombinant and fortified nutraceuticals (Singh et al., 2018).

1.3.1. Recombinant Nutraceuticals

Biotechnology techniques have been successfully employed in a fermentation process to extract enzymes suited for providing critical nutrients at an optimal level in a variety of foods such as cheese and bread (Chanda et al., 2019). Biotechnology assists in the formation of energy-delivering foods such as bread, wine, fermented starch, yogurt, cheese, vinegar, and others. Biotechnology allows for the production of probiotics and the extraction of bioactive components using enzyme/ fermentation technologies, as well as genetic engineering (Singh and Sinha 2012).

1.3.2. Fortified Nutraceuticals:

Fortified nutraceuticals are made by fortifying dietary components and then adding micro-nutrients (trace elements or vitamins) to the final product (Srivastava, 2018). The process of adding crucial minor components and nutrients to food to improve the efficiency and nutritional value of the food is known as fortification (Ruchi et al., 2017). In children with diarrhea, respiratory infections, and serious illnesses, prebiotics, and probiotics, preserved milk containing *Bifidobacterium lactis* HN019 are ingested (Sazawal et al., 2010). Persistent bananas could be developed as effective foods to combat iron deficiency caused by malnutrition (Kumar et al., 2011).

1.4. Classification by chemical nature

Nutraceuticals are classified according to their primary and secondary metabolite sources, which include isoprenoid derivatives, phenolic substances, amino acid-based substances, carbohydrates and derivatives, fatty acids and structural lipids, and minerals (Chanda et al., 2019).

III. RECENT TRENDS IN INDUSTRY

- All things about cannabis
- Nutricosmetics
- Supplements for pets
- Plastic packing problem
- Niche sport nutrition
- Trend in online marketing of Nutraceutical

1.5. All things about cannabis:-

It is surprising news about cannabis there was a passing cannabis act 2018. It gives legality for in farming or cultivation of hemp or marijuana and their drive product in the US. Cannabidiol is the active ingredient that is derived from cannabis or hemp which is used in nutraceuticals [7, 70].

As per US FDA CBD is an active constituent of cannabis. In 2018 the cannabidiol tincture nutraceutical market is growing with a revenue share of 42.6% because of increasing acceptance CBD for human being wellness CBD provides health benefits and human wellness without any psychological effects and also used active ingredients in epilepsy [64]. But one of the statement given by the FDA is CBD not be used in food supplements and beverages. The cannabis food product is legal in some states, but they have certain limits on it (How much quantity they can use) and the market for such a state is blooming [64]. Due to the benefits of the CBD and public awareness about cannabidiol the market was growing [63]. According to the report of Grand View Research the cannabidiol is used nutraceutical, the market was growing all over the world to exhibit a CAGR of 18.8% during the forecast period. The global value is assumed is \$7.7 billion in 2017. It reaches up to \$17.4 billion in 2020 and has been reached USD \$34.1 billion in 2021 [63]

1.6. Nutricosmetics:-

The term nutricosmetics is defined as natural skincare or health care products that improve the appearance and function of human hair, nails, and mainly the skin [61]. The naturally

occurring ingredients used in the nutricosmetic for beautification and personal for hygiene benefits [8]. Nutricosmetic is supplements used for maintenance and in improving the appearance of the skin and overall beauty of the body [8].

It is one of the most emerging trends in the nutraceutical products industry. The industrial value of the nutricosmetic is increasing year by year. This is because our next generation is crazy about beauty and personality, therefore they used chemical cosmetics, but in recent years study on cosmetics is found that they have many side effects on the skin like skin dryness, the blackness of skin, aging signs by their overuse [61, 68].

Then they give preference to the naturally occurring ingredients because they didn't have any side effect and 100% natural. The ingredient used in nutricosmetic are vitamin C, Vitamin K, β carotene, polypodiumleucolomes, polyphenol, various herbal extracts (Neem, aloe vera, etc) [8]. The popularity of nutricosmetics in men and women is unexpectedly increases. One study found that about 84% of men age 18-44 use nutricosmetic and skincare products [61, 64].

The other concept emerging in nutricosmetic is nutricosmetic food and beverages [67]. It is a simple concept in which some ingredients that have medical and beauty benefits are added in supplements e.g. snacks bar, bakery products, fortified food. Fortified beverages contain fortified coffee, herbal tea, etc. These are products that contain are vitamins, minerals, herbal ingredients [8, 12].

The other trend is related to collagen. The demand for collagen is high throughout the period in industry, but some of the consumers are vegan, they look for alternatives to collagen. Some of the other non-animal sources used for nutricosmetic [12].

E.g. Bamboo, silica, gooseberry extract, etc.

The global market of nutricosmetics is growing because of the factors like increasing consumer awareness about the personal care and give the performance of grooming and healthy lifestyle [61]. As per the report the global nutricosmetic market is USD 4.73 billion in 2016 and 2019 is USD 121 billion and it goes up to USD 179 billion in 2022, which increase about by 50%. [61]

1.7. Supplements for Pets:

In today's world man considers pets as family members, therefore for their health and treatment, well growth they used pet nutraceutical, and the popularity of pet supplements is increasing

[56]. The pet supplement mainly consists of vitamins and minerals for the growth of pets [54]. The owner of the pets is not only feeding them but also take care of the health of pets [64].

A study conducted by the American pet product association (APPA), under national pet owner survey, it is found that 76 million people in the US have one or two pets in their homes in 2018-19 [52].

When we come for pet supplement and pet food, the pet owner thinks the food is natural, contain organic ingredients and free from genetically modified cells & organs. Thus, these food supplements are safe and beneficial for pet health and reduce the risk of giving the contaminated products to pets [57]. This is a fact about the pet owner that especially purchases natural and organic supplements [51].

As per the report market control, it will find out that most of the younger people adopt the pet. It is another good factor for nutraceutical companies and pets [57, 58]. The owner of the pet is very conscious about the health of pets [51]. Therefore, they buy supplementary nutraceutical products for pets at the highest prices or the younger owner is more likely to spend an excessive amount of money on food for the pet's health [57].

The popular pet supplements and food products in the form of biscuits, soft chews, powder, liquid, Paste, and these forms make competition each other in the nutraceutical supplement market industry [50, 51]. The regulation related to the pet supplements is less as compared to the pets pharmaceutical. Therefore, it is an opportunity for the nutraceutical industry for pet supplements. For this reason, global market size increase pet nutraceutical [57].

According to market research, the global pet supplement sale is about USD 230 billion with CAGR of 3.5% in 2015-16 [51], in 2018 USD 580 billion. The pet nutraceutical market is growing CAGR 6.34 % and its value is USD 8.25 billion by 2023 as per the report of market research [55].

1.8. Plastic packaging Problems:-

The packaging of nutraceutical products is important because of the protection of the inner content, their freshness, and potency should be maintained. It is also important because to avoiding contamination and oxidation of the product [1, 74].

The various designs can make a positive impact on the consumer's mind for buying nutraceutical products and nutricosmetics e.g. UK based sports nutrition companies increased 300 % profit after a dramatic design of packaging [59].

The material used in packaging is plastic, glass, paper, metal, etc [1,6]. The plastic material has a negative impact on the environment or people. The material used other than plastic is sustainable and create a positive impact on the environment and people's [1] [60].

The packing material for nutraceuticals should be sustainable and environmentally friendly, but the nutraceutical companies used plastic for packing. The plastic material is sometimes not comfortable with the nutraceutical product hence it isn't eco-friendly [2]. The most important factor in this trends recycling and reusing packing material. The various nutraceutical companies can change their attributes about plastic packing and find out alternative ways to packing made themselves greener [60, 62].

The alternative for plastic is cardboard to play the role of plastic in packing [62]. The compostable packing gaining popularity for nutraceutical products selling in public and consumers appreciate and accept the product [74]. Another alternative to plastic is a seaweed-based sauce packet that replaces plastic [1].

To keep environmental safety in mind and long-term effect of packaging material led to the inclination of manufacturers towards sustainable packaging by adopting green packaging solution [64]. It switched from plastic to paper is a major trend in the nutraceutical product packaging industry [2, 62].

The global market of nutraceutical packaging in 2018 is USD 2.78 billion, report analysis is estimated to cross USD 4.2 billion in 2027 and the CAGR is 4.8% over the forecast period time i.e. 2019-27 [74] and in 2029 near about USD 5 billion [53].

1.9. Sports nutrition supplements:-

The megatrend highlighted in 20th century is growing market of sport nutrition supplements with other sectors like energy, workplaces, and weight management (basically find in most of the woman's)

The sports nutrition supplement mainly consists of protein powder, vitamins, a branched chain of amino acids, probiotics, omega 3 fatty acids, etc for boosting energy and make strong immunity power [22].

The athletics and bodybuilders are very caring about their fitness, health, and disease-free life. They daily consume the nutraceutical supplements for gaining energy, and strong muscular body and to increase the disease-resistant capacity [22].

The highest consuming nutraceutical supplements in athletics are proteins. There are various forms used for delivering the nutritional supplement such as powder, protein bar, shakes, beverages, fortified cookies, chews, gums, and these forms have different importance according to that time they use [21].

Another consumer group for sports nutrition supplements is women, according to research, 63% of woman's have looked for their general health improvement and wellness, and 45% attempt the healthiest diet plans with nutritional supplements[73]. This is because women give priority to their weight management, strong bone and muscle strength, and a healthy fit lifestyle [64].

Another factor is for the growing sport nutraceutical market is, increasing the number of gym and health club centers in the overall globe. The participation of people in fitness-related sport increases significantly. According to the report of 'Physical Activity Council' in 2018, 64% US population of age over six are engaged with sports activity [72].

The global sport nutraceutical market value is USD 15.6 billion, with CGAR 3.9% over the forecast period of time and it is expected to reach USD 31 billion by 2027 CAGR 8.9% over the forecasts period of time [68,72]

1.10. Trend in online marketing of Nutraceutical:-

The global market of nutraceutical products in recent years is shifting from shops, malls to laptops mobiles to buying nutraceutical products which create large or more opportunities for growing nutraceutical market dynamically.

The online marketing of nutraceutical supplements through email, android apps, social media (Facebook, Instagram, and Twitter), television, youtube, etc. for directly communication with the consumer. The nutraceutical company also enhances brand awareness through the above things [71]. The customer also visits the various websites, blogs for collecting information about health related queries and product related to their health queries and problems, also checks products quality by seeing the public review of the product by different sources of internet.

The manufacture has been creating their blogs on the internet and website for the marketing of products. The manufacturer-provided all the necessary information about the regular health problems of peoples and how their product is beneficial for them. The manufacturer creates the need for their product by telling the people about

the future problem of health. This is a psychological strategy that impacts on people.

By the proper design of the product and proper labeling is creates a firstly positive impact on the consumer mind. Therefore nutraceutical products have attractive label designs and they build up their product as a brand in the market for popularity.

These are the few basic strategies for online marketing of nutraceutical supplements such as Website, Email [71], Paid advertisement, Affiliate marketing, Amazon paid promotion.

For the modern business of nutraceutical supplement products, the companies have their separate website which gives all information about the company and products manufactured by the company. Email marketing is also another strategy for product marketing. According to research, 46% of people open their mail on mobile. Therefore, it is a more beneficial opportunity for nutraceutical supplement marketing.

The paid advertisements give much more needed visibility to the product. Advertises directly target customers according to their interest. It helps to reach product information to each & every person.

Affiliate Marketing is an emerging trend in the nutraceutical industry. It is a third-party publisher, which helps to the company for marketing the product all over the world. It is also taking the feedback of the product from consumer and analyses the requirements of the people and give the needed visibility to product.

Amazon paid promotion it is one the strategy for online marketing of nutraceutical. Online shopping on amazon is increasing significantly in recent years. Amazon showcases products and also gives dedicated space for nutraceutical product and helping to a company to get in front of millions of peoples and buyers.

As per the research report of Euromonitor international, the global nutraceutical supplements market is growing worth USD 68 billion with online selling. The online sale of a product in the US has grown by 15.8% in 2017 and the total estimate is about USD 45.3billion & expected to reach USD 56.7billion in 2024.

The global dietary nutraceutical supplement market is expected to reach USD 210.3 billion in the year 2020 CGAR 6.4%.

IV. TYPES OF THE DELIVERY SYSTEM OF NUTRACEUTICALS:-

4.1. Nano-emulsion:-

Nanoemulsion is a homogeneous, biphasic, thermodynamically stable system composed of the dispersed phase (inner phase) and dispersion phase (continuous phase or outer phase). i.e oil phase dispersed in aqueous phase vice versa [18, 42]. These are the emulsion which has extremely small nanosized particles and appeared as transparent and translucent appearance. [69] (Particle size is 50-200nm) [18, 46].

Nanoemulsion is one of the best options for poorly water-soluble bioactive constituents. Most of the nutritional ingredients are lipophilic in nature therefore they easily incorporated into nanoemulsion [43].

The entrapment of such bioactive constituent in nanoemulsion has a very small size therefore they have a greater particle size area, thereby increasing the absorption rate and epithelial cell permeability, [43] then the therapeutic effect and bioavailability of nutritional constituent increases spontaneously [39].

The other advantage of nanoemulsion is they protect the bioactive constituents from oxidation, thereby, increase the stability and decreases the degradation of bioactive constituents from the gastrointestinal environment [45].

4.2. Liposomes:-

Liposomes are the type of lipid-based drug delivery system. It is defined as a spherical, bilayer vesicle made up of phospholipid and surfactant. The ideal size of liposomes is 100-400nm [41][66]. Liposomes are investigated as a potential drug delivery system because of their higher biocompatibility and the other advantage is both hydrophilic and hydrophobic types of active constituents can be delivered by liposomes [41].

The Liposomes are mainly composed of phospholipid (lecithin). The phospholipid has a head and tail-like structure i.e. hydrophilic head and lipophilic tail. In bilayer vesicle structure, a hydrophilic head faces the hydrophilic environment and a hydrophobic tail faces hydrophobic tail [41]. The lipophilic nutrients are incorporated in the lipophilic or hydrophobic region and hydrophilic nutrients are incorporated in the hydrophilic region i.e. central vesicle of liposomes [40].

The nutritionally active constituents are incorporated into the vesicle of liposomes and the

hydrophilic and hydrophobic bioactive constituents are delivered from it [43].

Liposomes are advantageous as compared to the other dosage form because of high biocompatibility and absorption rate, i.e. deep intracellular delivery of the nutrients. Liposomes avoid the pain associated with the injection [38, 41].

4.3. Probiotics:-

The microorganisms which are beneficial for human, that can alter the gastrointestinal microbial flora and give and give beneficial effect by maximum absorption of nutrients to the host [9, 44]

The probiotic microorganisms can be delivered through the various types of vehicle such as they incorporated in the gel, capsule, suspension, emulsion using various techniques such as spray drying, extrusion, encapsulation, etc [9].

The emulsion is used for the encapsulation of the lactic acid bacteria. In this process, the probiotic cell and polymer solution is emulsified with dispersion or continuous or outer phase (e.g. sunflower oil, soy oil) [44].

Microparticles of probiotic microorganism's cell can be prepared by spray drying technology. In this process probiotic cell is dissolved in a polymer matrix and sprayed through the nozzle, then after spraying the droplets are drying in an evaporation chamber and uniform size microparticles are formed [27].

4.4. Phytosomes - (Phyto- plants, Somes-cell like)

Phytosomes are the type of phospholipid delivery system and are defined as "complex spherical, vesicles like structure made up of phospholipid in which plant extract or water-soluble phytoconstituents or bioactive constituents are incorporated in vesicles and provide lipid compatible molecular complex" [15].

Phytosomes enhance the absorption and bioavailability of bioactive constituents. It is able to transfer across the lipid bilayer i.e from the hydrophilic to the lipophilic region in the body. Thus the therapeutic effect of nutrients and Phytoconstituents is increased [15].

Different herbal extracts which consists of flavonoids, carotenoids, terpenoids, are delivered by the phytosomes. One of the advantages of phytosomes is they are more stable than liposomes and increase the nutritional value of herbal extract by enhancing permeability across the membrane.

Therefore the market demand of phytosomes is higher [15].

4.5. Nanoparticle:-

Nanoparticle is extremely small, spherical particle which a size less than 100nm. There are various types of nanoparticle like a lipid-based nanoparticle and Polysaccharides-based nanoparticle [69].

The polysaccharides-based nanoparticles are used for both hydrophilic and hydrophobic components delivery. Due to the structural ability and site-specific action, they are acting as a carrier for nutraceuticals (nutrients) or targeted delivery system for nutraceutical [38].

Nanoparticles has good stability, high loading efficiency, and a controlled release mechanism for the release of bioactive constituents, therefore, they have a long-term effect and give maximum therapeutic effect [42]. The size of nanoparticles is very small therefore they show high permeability across the lipid bilayer (high absorption rate) and higher bioavailability of nutrients [38].

4.6. Nanohydrogel

Nanohydrogel is water-swallowable a cross-linked polymeric system which does dissolve in water, i.e nanohydrogel is a network of cross-linked polymers. Nanohydrogel has three-dimensional complex structures have the large surface area, and hydrophilic nanosized structure or network. The structure of nanohydrogel is controlling the release of bioactive ingredients or nutrient, hence they increase the bioavailability of nutrients [47].

The nanohydrogel has the highest loading capacity and it improves the therapeutic efficacy by controlled, sustained, and targeted delivery of nutrients [49]. Both hydrophilic and hydrophobic nutrients have been delivered by it. The nanohydrogel plays a dual role of nanogel and nanoparticles. One of the benefits of nanohydrogel is biodegradable in nature, therefore they are nontoxic in nature.[47]

The Nanohydrogel is formed by various techniques like emulsion polymerization technique, reverse micellar method, membrane emulsification, photographic technique, and micro molding method, etc [48].

V. CONCLUSION

In this review, we extensively discussed about the need of nutrients to the human beings to

boost the immune power and the nutrients from different natural sources such as plant probiotics and prebiotics and biotechnological derived food. The recent emerging trends in the nutraceutical industry is all things about cannabis, nutricosmetics, supplements for pets, plastic packing problem, sport nutrition supplements, a trends in online marketing of Nutraceutical and because of this trends, the market of nutraceutical is grown up year by year. The cannabis is tried to use as a nutrition source in minimum quantity. The use of nutrients in nutricosmetics is a fastest grown field in industry and the requirements of pet supplements are also increases. The plastic packing problem is common in nutraceuticals, so the industrial expert finding an alternative to plastic and developing green environment. The demand for spot nutrition supplements are increasing day by day therefore it is an important trend to grow the nutraceuticals market. The marketing of nutraceutical products by different tools are emails, android apps, social media, television advertisements, etc is also increases the nutraceutical market all over the globe. The recent carry out on the delivery systems for nutrients such as nanoemulsion, liposomes, probiotics food, phytosomes, nanoparticles, nanohydrogel to increase the bioavailability of nutrients.

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Abbreviations

Giatrics patient (G.P.), Diabetes mellitus (D.M.), Nutraceuticals industry (N.I.), Gastrointestinal (G.I.), Acquired immunodeficiency syndrome (A.I.D.S.), American pet product association (A.P.P.A), Immunity lifestyle (I.L), Metabolic disorder (M.D), Neurodegenerative diseases (N.D).

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