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E-DISTRIBUTION TRENDS IN MORINGA OLIEFERA LEAVES CAPSULES AND WHEATGRASS CAPSULES

Madhuri K. Trivedi, Dr. A.Kumar

ABSTRACT

In reaction to the tremendous transformations in people's socioeconomic positions that have taken place over the course of the last few decades, people's priorities with regard to their health and their way of life have evolved. They are aware of the risks that are associated with consuming synthetic products. They do this because they believe that natural therapies are superior. Because natural products produced from plants tend to have fewer negative side effects, there has been an increase in their use in recent years. The potential for natural products to deliver additional health benefits above and beyond those offered by traditional nutrition is immense. Because it may be used in so many different ways, both medically and nutritionally, Moringa oleifera is one example of a tree that fits this definition. It is packed with essential nutrients as well as bioactive chemicals that are necessary for the body to maintain normal function and defend it against sickness. This particular tree may be consumed in its whole, from the leaves to the flowers to the seeds, and all of these components contain significant medicinal chemicals, such as those that are anti-diabetic, anti-cancer, anti-ulcer, antibacterial, and antioxidant.

The Wheat Grass Market has expanded significantly over the past decade. Furthermore, wheat grass's health advantages have gained popularity, making it a viable substitute for other common grasses. Wheatgrass may be utilised as a cow feed, soil amendment, or bio-fuel feedstock, giving it a wide range of potential applications and market potential. Product, end-use, channel, and region all play a role in the Wheat Grass Market's breakdown. Wheat grass has a wide range of potential uses, from human and animal food to bio-fuel and even as a soil amendment, giving rise to a sizable market for the product. Demand for natural and organic products has been on the rise in recent years, and increased health consciousness and technology developments have contributed to the market's potential for expansion. The research examines manufacturers and suppliers throughout the world, outlining the variables that are driving demand. These elements include, among others, developing technologies, new regulations, and investment needs. The growing interest in eco-

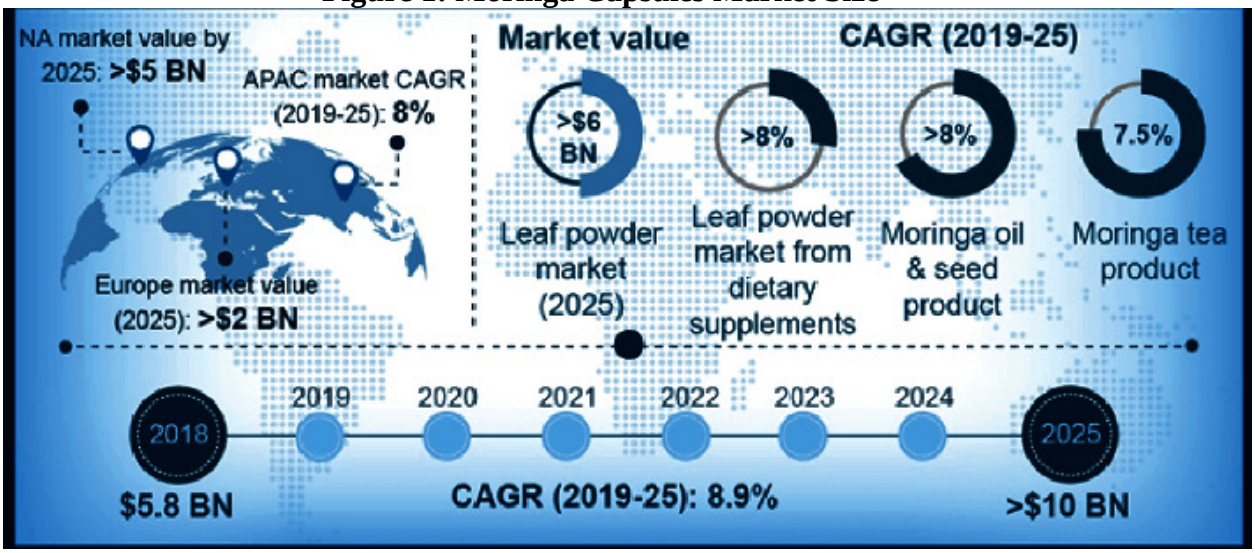
friendly and healthful practises is fuelling market growth. Recent studies have found that include Moringa and Wheatgrass in meals can be a beneficial addition, as would be expected. The Moringa oleifera & Wheatgrass plant and the many ways in which it may be used as a food additive are the main topics of discussion in this article.

KEY WORDS: Moringa oleifera, Wheatgrass, Development, Manufacturing, Additives.

INTRODUCTION

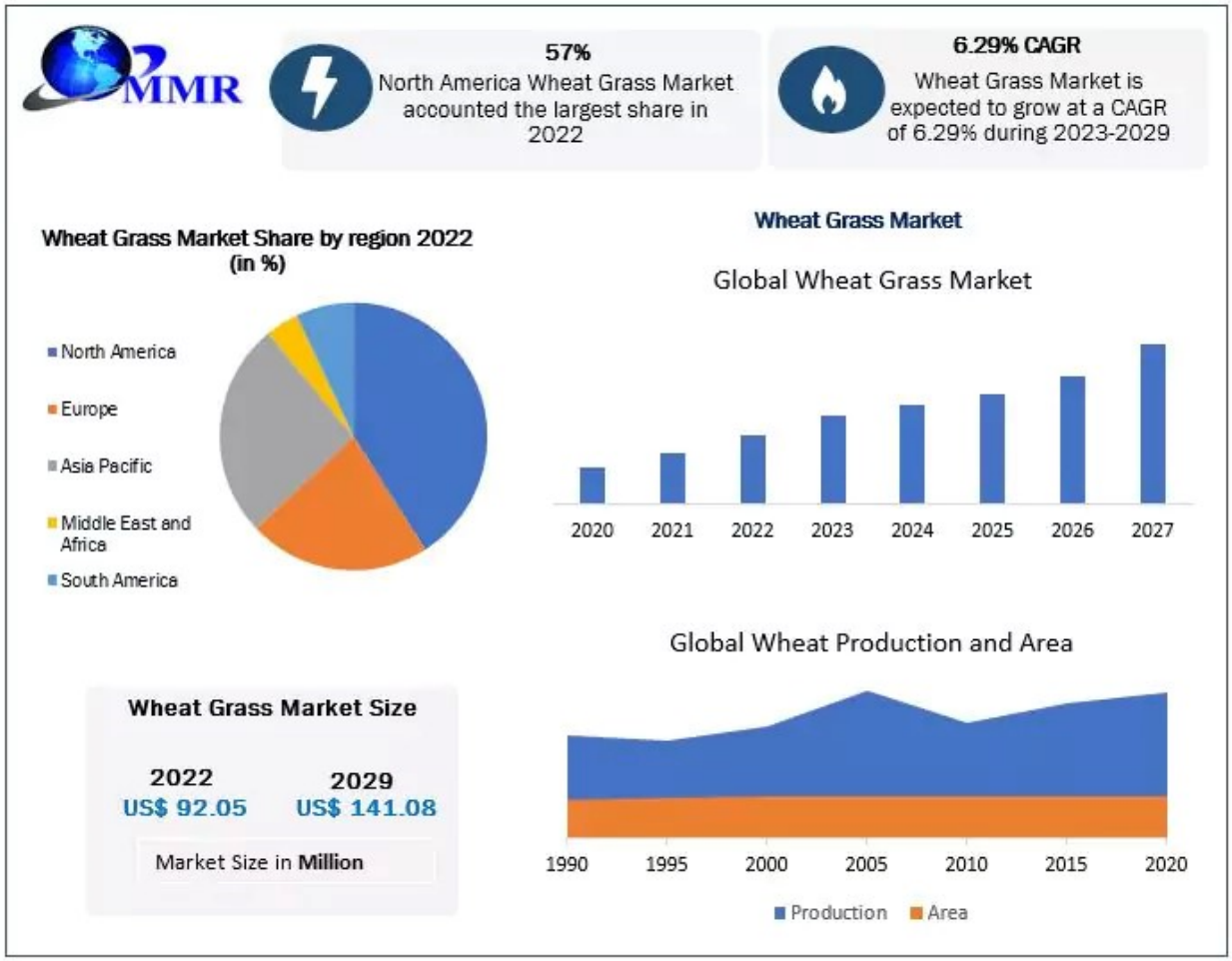
"Reduce by half the proportion of children who are malnourished (MDG)" is one of the primary goals that have been established as part of the Millennium Development Goals, which are intended to eliminate extreme poverty and hunger. Hunger, on the other hand, refers to a situation in which there is an insufficient supply of food. Malnutrition is not the same thing as hunger. People suffer from malnutrition when they do not consume sufficient quantities of nutritious food to support their continued growth and well-being. According to the report "Know Your World," published by The World Hunger Project in November 2017, there are 7.6 billion people on the earth, yet 815 million of them do not have enough food to eat. Population growth will, over the course of time, push the boundaries of food security farther and more out of reach, making it increasingly difficult to achieve. According to research conducted by the Food and Agriculture Organisation of the United Nations (FAO), even if our planet possesses the capacity to provide adequate food supplies, the agricultural industry would need to be subjected to severe disruption in order to reach its full potential [1]. Moringa oleifera is a kind of tree that is native to the Indian subcontinent and belongs to the family Moringaceae [2]. This species of tree is known for its rapid growth and resistance to drought. As a result of its various culinary and therapeutic uses, it is cultivated for commercial purposes for the production of its immature seed pods and green leaves. As a result of the significant amount of protein that it contains, many people consider it to be a good nutritional supplement. It has been given the name "miracle tree" [3] because to the wide variety of medicinal characteristics that it has. For instance, it has 17 times as much as calcium as milk, 10 times as many vitamins as carrots, 7 times as much vitamin C as oranges, and 15 times as much as potassium as bananas. Additionally, it helps in increasing levels of antioxidants in the blood [4], lowering levels of blood sugar [5], and relieving chronic inflammation [6]. As a result of the growing demand in the nutritional supplement and food applications [7], it is estimated that the worldwide market for Moringa leaf powder will approach USD 6 billion by 2025 (Figure 1).

Figure 1: Moringa Capsules Market Size



The Wheat Grass Market has expanded significantly over the past decade. Furthermore, wheat grass's health advantages have gained popularity, making it a viable substitute for other common grasses. Wheatgrass may be utilised as a cow feed, soil amendment, or bio-fuel feedstock, giving it a wide range of potential applications and market potential. Product, end-use, channel, and region all play a role in the Wheat Grass Market's breakdown. Pines International, Inc., Naturya, Synergy Natural Products Pty Ltd, Navitas Organics, and Terrasoul Superfoods are just a few of the major competitors in this sector, and they all point to the optimistic outlook of the industry as a whole. With a current market value of US$92.05 Mn in 2022, the Wheat Grass Market is expected to increase at a CAGR of 6.29% through 2029. By 2029, the wheat grass industry is predicted to be worth $141.08. Due to technological improvements that have made wheatgrass production and harvesting easier, Wheat grass has a wide range of potential uses, from human and animal food to bio-fuel and even as a soil amendment, giving rise to a sizable market for the product. Demand for natural and organic products has been on the rise in recent years, and increased health consciousness and technology developments have contributed to the market's potential for expansion. The research examines manufacturers and suppliers throughout the world, outlining the variables that are driving demand. These elements include, among others, developing technologies, new regulations, and investment needs. The growing interest in eco-friendly and healthful practises is fuelling market growth as presented in figure 2.

Figure 2: Wheatgrass Global Market



The significance of Moringa oleifera & Wheatgrass in the food and nutraceutical industries in capsule form and its potential to improve human health and well-being are

highlighted in this research. It examines Moringa oleifera & Wheat grass's present and potential future usefulness as a dietary supplement for humans.

MORINGA OLEIFERA

India is the country that is responsible for the bulk of both the production and the international trade of M. oleifera [8]. This comprises fresh and canned fruits, as well as oil, seeds, and powder made from leaves. There are between 1.1 and 1.3 million metric tonnes of tender pods produced in India every year [9]. According to data provided by Zauba.com, between June 2013 and July 2015, India exported 836,806 kilogram's worth of Moringa leaf powder valued at USD 4,746,132. The United States is the largest single market for Moringa leaf powder, accounting for yearly sales of $3,303,870, making it the country with the highest spending on this product. Germany, at a cost of $364,170, and the United Kingdom, at a cost of $162,365, are other significant customers. During the same time period [10], the Netherlands imported Moringa leaf powder with a value of 12,594 dollars. On the other hand, Moringa oleifera is not cultivated in India for the purpose of making a profit. The pods itself are the part of the plant that is consumed by people, whereas the leaves and blossoms are utilised only very infrequently. In order to enhance the appeal of Moringa both in its own country and in other countries, governments and non-profit organisations alike should study the possibility of exporting Moringa.

MORINGA: A MIRACLE TREE

Both seeds and cuttings may be used to create Moringa trees, which are known for their rapid growth. The leaves of the tree are genuinely outstanding in spite of the fact that they mature at a quick rate on soil that is low in nutrients. In addition, the tree is resistant to drought, which allows it to thrive even in climates that are extremely hot and dry. In many tropical and subtropical regions, people eat the tree's leaves, fruits, flowers, and even its unripe pods [17, 18]. This tree's blooms are also edible. The plethora of important components that may be found in the leaves, pods, and seeds of the Moringa plant contribute to the plant's high nutritional value. Moringa has seven times as much vitamin C as oranges, ten times as much vitamin A as carrots, seventeen times as much as calcium as milk, nine times as much protein as yoghurt, fifteen times as much potassium as bananas, and twenty-five times as much iron as spinach, according to some sources [3, 4]. Moringa also contains nine times as much protein as yoghurt. The nutritional content of only one Moringa leaf is more than that of an egg, a spinach serving, a carrot, and a glass of milk combined. Moringa leaves are quite small. The Moringa plant has been shown to be an excellent source of energy and may also have use in medicine and cosmetics (its seed oil may be beneficial for hair and skin care). Moringa tree seeds are an exceptionally healthy food option due to their high nutrient content. Extracts from seeds are potent antibacterial agents that may be added to drinking water to make it less hazardous to one's health. A lot of studies have indicated that eating Moringa seeds can lower the levels of oxidative stress, inflammation, blood sugar, and blood pressure in the body. Moringa is gaining popularity among underprivileged people and those who are malnourished because to the great nutritional value it has.

People in today's society are generally conscious of the calories they take in, despite the fact that their hurried schedules frequently push them to do so regardless of their awareness. These kinds of eating behaviours are linked to an increased risk of developing a number of chronic diseases; including obesity, high blood pressure, diabetes, and others. In order to keep up a balanced lifestyle, it is absolutely necessary to consume a nutritious diet that is abundant in nutrients such as vitamins, minerals, and polyunsaturated fatty acids, among other things. Moringa leaf capsules have become increasingly well-known as a nutritious dietary alternative due to the fact that they are both high in protein and simple to digest [14]. According to Sultana and Anwar [19], the leaves of the Moringa tree contain a variety of healthful components, such as protein, vitamins, calcium, iron, ascorbic acid, and

antioxidants (carotenoids, flavonoids, and phenol). Moringa is a source of nourishment for children in several nations of the developing world and the third world [20]. According to study carried out by Busani and colleagues [21], the presence of a number of minerals and vitamins contributes to an increase in one's resistance to illness. The Moringa leaf capsules contain an abundance of amino acids, which are the building blocks of protein. However, it is not uncommon for the levels of nutrients to fluctuate depending on factors such as climate, location, and the environment [22]. Tea, medicinal powdered capsules, and Ziga drinks are only some of the modern applications for Moringa leaf capsules [23]. Moringa leaf capsules are also used to make other beverages. Because of its purported power to make people healthier, the miracle tree is held in high regard. Table 2 shows the approximate chemical profiles of fresh Moringa leaf capsules, dried Moringa leaf capsules, and Moringa leaf powder [24, 25].

Table 1

Proximate profiles of Moringa fresh leaves, dry leaves, and leaf powder Capsules

Nutrients	g/100 g plant materials		
	Fresh leaves	Dry leaves	Dry leaf powder
Protein (g)	6.7	29.4	27.1
Fats (g)	1.7	5.2	2.3
Carbohydrate (g)	12.5	41.2	38.2
Fiber (g)	0.9	12.5	19.2

Protein is a type of macronutrient that is essential to human growth. It is also commonly referred to as a building block unit. There are several different types of phytochemicals that may be discovered in Moringa leaf capsules, some of which include sterols, tannins, flavonoids, alkaloids, saponins, and terpenoids [26]. Amino acids, both necessary and non-essential, are strung together in lengthy chains through the use of peptide bonds to form proteins [27]. Because the body can only manufacture “essential” amino acids, it is necessary to get them from food because the body cannot produce them on its own. Eggs, chicken, fish, and other types of meat, as well as poultry, red meat, and red meat products, are all good sources of essential amino acids. Vegetarians should be concerned about this issue because the majority of plant-based proteins do not provide the complete amino acid profile essential, while having the highest concentration of amino acids. Therefore, the dried and powdered Moringa leaf could be a suitable alternative to protein, particularly for the essential amino acids. According to research conducted by the American Dietetic Association and Dieticians of Canada, the amount of protein necessary for the rebuilding of muscle tissue ranges from 1.3 to 1.7 grammes per kilogramme of body weight. Table 3 [28-32] provides a summary of the percentage of the dry matter that is composed of protein for a variety of different sources of protein.

Table 2

Protein content in various plant leaves including Moringa

Food origin	Protein content (% dry matter)
Rice	7.4
Wheat flour	12.1
Mulberry leaves (*Morus alba)*	20.88
Anchote leaves (*Coccinia abyssinica*)	21.6
Alfalfa leaves (*Medicago sativa)*	18.1
Moringa oleifera	
Fresh leaves Capsules	6.7
Dry leaves Capsules	29.4
Leaf powder Capsules	27.1

It is possible to draw the conclusion from the information presented earlier that the protein content of Moringa leaf capsules is higher than that of the other possibilities. It has been established as a source of protein that, when consumed on a regular basis, can assist in the feeding of those who are malnourished [33]. Individuals in a variety of countries consume nearly all of the Moringa oleifera plant in its many forms. These individuals come from all over the world. Moringa leaf capsules can be dehydrated and ground into a powder for eating at a later time [14]. This process is feasible. The flavour of the green, dry seeds is also rather good [34]. On the other hand, the leaves of the Moringa tree are packed with a variety of different amino acids. Moringa leaf capsules include Thr, Met, Ile, and Lys in addition to Val, all of which are amino acids that are often present in animal proteins [22]. Powder made from Moringa leaf capsules has been used in a number of innovative products in recent years. A comparison of the amino acid patterns found in proteins derived from Moringa leaf capsules with those found in proteins derived from more conventional sources of animal and plant matter is presented in Table 4 [2, 31, 35].

The body of an animal requires a large variety of micronutrients in addition to the three macronutrients (carbohydrates, protein, and fat). These micronutrients are essential to optimal health because they aid in the transit of macronutrients or in the breakdown of macronutrients. Because they contribute to the synthesis of cellular energy in the body, vitamins are extremely important. Vitamin deficiencies can lead to a wide variety of conditions, including but not limited to beri-beri, rickets, scurvy, and others. Moringa oleifera has been shown to contain a variety of vitamins, including vitamins A (beta-carotene), B (folic acid, pyridoxine, and nicotinic acid), C, D, and E [36]. This leads one to believe that Moringa leaf powder or processed foods manufactured from Moringa may be high in various nutrients. In addition to the several different vitamins that it delivers, Moringa is an excellent source of a variety of minerals that are essential for healthy development and growth. Moringa powder that has been dried is an exceptional source of calcium, which is one of the most important components. It contains calcium in concentrations that are 17 times greater than milk does [22]. In the absence of that, its iron concentration is 2 mg/100 g, while its zinc value ranges from 25.5-31.03 mg/kg [22]. It is adequate to fulfil the requirements for reaching the recommended daily amount for zinc [37]. Table 6 depicts the many vitamins and minerals that may be found in the leaf pods, as well as the seeds, which can be found in the plant [24, 38].

Table 3
The vitamin and mineral compositions in capsules of leaves, seeds, and pods

Nutrients	mg/100 g plant materials				
	Fresh leaves Capsules	Dry leaves Capsules	Powder Capsules	Seed Capsules	Pods Capsules
Vitamin B1	0.06	2.02	2.64	0.05	0.05
Vitamin B2	0.05	21.3	20.5	0.06	0.07
Vitamin B3	0.8	7.6	8.2	0.2	0.2
Vitamin C	220	15.8	17.3	4.5 ± 0.17	120
Vitamin E	448	10.8	113	751 ± 4.41	—
Calcium	440	2185	2003	45	30
Magnesium	42	448	368	635 ± 8.66	24
Phosphorus	70	252	204	75	110
Potassium	259	1236	1324	—	259
Copper	0.07	0.49	0.57	5.20 ± 0.15	3.1
Iron	0.85	25.6	28.2	—	5.3
Sulphur	—	—	870	0.05	137

The ratio of antioxidants to oxidants that is generally found in the human body is one to one. The body's continual release of reactive oxygen species can be attributed to the daily stresses [39]. Antioxidants are produced by the cells of the body as a defence mechanism against the damage caused by free radicals. The presence of oxidative stress can be traced to problems originating in any one of these processes. It's possible that this is caused by any one of a wide variety of conditions, as well as interruptions to the body's usually operating physiological system [40]. When cell damage reaches its most advanced state, it can oxidatively change into a number of other chronic diseases [41]. Antioxidants have been proven to give a positive feedback that helps avoid more damage in such chronic situations, as detailed by Kattappagari et al. [42]. This was discovered by Kattappagari et al. The Moringa tree has the potential to be regarded as a substantial source of antioxidants due to the fact that it is capable of producing more antioxidants than other plant-derived sources on the market. Extracts from the Moringa tree may be utilised in the production of a large number of different types of products.

RESEARCH STRATEGY FOR THE WHEAT GRASS INDUSTRY

The analysis of the Polydextrose Industry that is included in the report on the Wheat Grass Market makes use of both primary and secondary sources of information. The results of the study are confirmed by primary research, and then those findings are compared to the secondary data in order to form actionable conclusions about the market. The forecast for the market takes into account a broad variety of economic factors, such as rising prices, newly enacted rules and regulations, and other factors as well. We get at these numbers by performing a bottom-up study in conjunction with various other methodologies that include triangulating the data. The report presents percentage splits, market shares, and breakdowns of the various industries in accordance with the utilisation rate and the average sale price. The size of the market in each region or country is determined by looking at what proportion of the entire market has been adopted or used in that region or country. Both primary and secondary research are utilised in the process of identifying major market participants. These participants are determined based on characteristics such as revenue, price, services supplied, innovations, mergers & acquisitions, and joint ventures. After conducting comprehensive market engineering and calculations for market statistics, market size estimations, market projections, market breakdown, and data triangulation, the prediction was finally arrived at. The research investigates both internal and external elements that are anticipated to have either a positive or negative influence on the company in order to provide decision-makers with a comprehensive picture of the future of the industry. The analysis gives estimates for the future growth of the worldwide wheat grass market, which is essential for making business choices. Additionally, the study dissects the global wheat grass market into its component sections. This report may be used as a reference for potential investors since it provides an accurate depiction of the competitive analysis of major firms operating in the global wheat grass market with respect to price, financial status, growth strategies, and geographical presence.

MARKET TRENDS

Consumers in today's society are more health-conscious than ever before, and as a result, they place a high value on the consumption of foods that are beneficial to their wellbeing. Consuming foods that have several health benefits, for instance, may be beneficial in preventing or treating a variety of different forms of chronic illness. A different word for incredible dishes is the term “super food.” Research into how to find such supplies of food is a field that has just emerged over the past few decades.The global market for Moringa is

expected to experience substantial expansion in the near future. According to projections made by MRFR, the global market for goods derived from Moringa would increase by 9.3 percent, or $7,902.9 million, by the year 2025. The Moringa tree is integral to the manufacturing process for a wide variety of different sorts of products. In 2018, the Asia-Pacific region accounted for 35.30 percent of the total market for Moringa products in the world. The economies of Australia, China, India, and New Zealand have all been significant contributors to this expansion. Moringa is mostly cultivated in the regions of Asia and the Pacific. Because Moringa has traditionally been used in products for health, beauty, and hair care, the majority of the region's output stays within the region. The researchers forecast that the market in North America would have expanded at a compound annual growth rate of 10% by the year 2025.

The need for organic and natural components, an elevated awareness of the importance of maintaining a healthy lifestyle, and the surging appeal of Superfoods are all elements that are driving the growth of the wheatgrass sector. The market is supported by a lack of wheatgrass synthesis and processing, as well as improvements in immunological function, detoxification, and digestion. Additionally, the market is supported by the absence of wheatgrass. The high cost of wheatgrass is only one of the challenges that the industry must overcome in order to expand; additional challenges include the “COVID-19 outbreak”, supply issues, and altering client preferences. It is anticipated that the demand from consumers who are health concerned and who are looking for natural and nutrient-dense solutions will propel the sector ahead in the years to come.

The growth of the wheat grass market may be attributed in part too many factors, including the increasing demand for Superfoods, the growing interest of consumers in natural and organic products, and the growing awareness of the health benefits of wheatgrass. Because it contains a variety of vitamins, minerals, and antioxidants, wheatgrass is a popular choice among individuals who are concerned about the quality of their diet. Wheat grass is growing more and more popular in recent years as a dietary supplement, ingredient in functional foods, and component of beverages. The demand for wheatgrass products is on the rise, perhaps as a result of the growing interest in preventative medicine as well as the growing popularity of diets based on plant foods. It is anticipated that the growth of the market would be driven over the coming years by the proliferation of online shopping and the growing visibility of wheatgrass products on the web. The creation of innovative items and applications, the entry of new geographical markets, and tighter cooperation between current market participants are all potential drivers of innovation and growth in the wheat grass industry. Wheatgrass-based products can find a market since there is a rising interest in plant-based diets and organic, all-natural items, which creates room for the products to be introduced. In addition, cutting-edge technologies like as hydroponics and vertical farming have the ability to increase production while simultaneously lowering costs, resulting in an increased market potential. According on the findings of the analysis, tailored wheatgrass products will be produced in order to satisfy the rising demand for functional meals and specialised nutrition. The research indicates that the Wheat Grass Market will grow as a result of increased innovation, an expansion of the client base, and the introduction of new opportunities for collaboration. A lack of product distinctiveness, high production and processing costs, and competition from replacement products that are both less expensive and just as effective are the factors that are limiting the market for wheat grass. The potential demand for the product is hindered by the fact that consumers are unfamiliar with wheatgrass and the supposed health benefits it provides. Some customers won't buy your product because it has high manufacturing and processing expenses, especially in markets where there isn't much price competition. The expansion of the industry will be slowed down by the presence of competing products such as Superfoods and dietary supplements. The “COVID-19 virus”

has been spreading rapidly, which has delayed the progress of the wheat grass industry by causing supply chains to be disrupted and customers' tastes to change.

CONCLUSION

Moringa oleifera& Wheatgrassare well-known for the extensive range of vitamins, minerals, and free radical scavengers that it provides. Moringa leaf & Wheatgrass capsules, much like spinach and fenugreek, are not often consumed by humans. However, in Southeast Asia, these leaves are utilised as a replacement in a wide variety of dishes, such as soups, lentils, and other foods. On the other hand, not nearly enough is known about the effectiveness of Moringa& Wheatgrass as a nutritional supplement and fortifier. Moringa & Wheatgrasshas been used in both of these capacities, but not nearly enough. There is a huge amount of untapped potential in the use of Moringa& Wheatgrass that has not yet been exploited. It is possible to include it in the production of meals, which may be of aid in the fight against famine as it may be of use in the preparation of meals. The research that was published provides a comprehensive overview of the plant's pharmacological properties, as well as its chemical components, nutritional profile, and practical applications. The creation of potentially helpful food items that are high in health-promoting nutrients and might be used to treat a variety of lifestyle-related disorders as well as malnutrition may benefit from more research into the identification, extraction, and standardisation of plant extracts.

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