“A Review on Nutritional value of leafy vegetables and their potential contribution to human health”

Abstract:-

Leafy vegetables form an integral part of the Indian diet, contributing significantly to the nutritional well-being of the population. This review aims to comprehensively analyze the nutritional value of diverse leafy vegetables commonly consumed in India and their potential impact on human health. A systematic exploration of scientific literature reveals a rich array of essential nutrients present in these leafy greens, including vitamins, minerals, fiber, and phytochemicals. The nutritional composition of popular leafy vegetables such as spinach, fenugreek, kale, amaranth, and drumstick leaves is discussed, highlighting variations in nutrient content and their health-promoting properties. These vegetables are not only rich sources of vitamins A, C, and K but also provide essential minerals like iron, calcium, and magnesium, addressing prevalent micronutrient deficiencies in the Indian population.

Key words: Green leafy vegetables, Anti-nutritional factors, Nutritional factors.

Introduction:-

Green leafy vegetables are a significant the comprehensively analyze the nutritional composition of various leafy vegetables native to India, shedding light on the essential vitamins, minerals, antioxidants, and other bioactive compounds they contain. By delving into the rich tapestry of India's agricultural biodiversity, the review aims to provide a thorough understanding of how these leafy greens contribute to overall human health and well-being. ((Kumar et al., 2020). There are numerous underutilized greens in nature with promising nutritive value that can feed the growing human population. Green leafy

vegetables are of significance to the sustenance of the populaces particularly in the agricultural nations. India being honored with an assortment of normal environmental elements, differing environments, and seasons, has changed types of leafy vegetables. There is a significant consumption of leaves from a variety of sources, including aquatic, annual, and perennial trees. In addition to nutritional insights, the review explores the potential health benefits associated with the consumption of these leafy vegetables. This includes their role in preventing and managing various diseases, such as cardiovascular disorders, diabetes, and certain types of cancers. The review also investigates the impact of these vegetables on other aspects of health, such as immune function, digestion, and cognitive well-being. ((Ashok et al.,2020).

Green leafy vegetables involve a significant spot among the food crops as these give sufficient measures of numerous nutrients and minerals for people. They are rich wellspring of nutrients like beta-carotene, ascorbic corrosive, riboflavin, folic corrosive and minerals like calcium, iron, phosphorous and so on((Kumar et al., 2020). There are numerous underutilized greens in nature with promising nutritive value that can feed the growing human population. Green leafy vegetables are of significance to the sustenance of the populaces particularly in the agricultural nations. India being honored with an assortment of normal environmental elements, differing environments and seasons, has a changed types of leafy vegetables. There is a significant consumption of leaves from a variety of sources, including aquatic, annual, and perennial trees. A portion of the generally consumed leafy vegetables are spinach (Spinaciaoleracea), amaranth (Amaranthusgangeticus), fenugreek (Trigonellafoenumgraecum), drumstick (Moringaoleifera), cabbage (Brassica oleracea var. capitata), bathua (Chenopodium collection), and so on((Ashok et al. ,2020).

They are vigorous distrustful food varieties and helpful for the upkeep of well-being and for the evasion of dissimilar diseases. In addition to adding variety to the menu, they are valuable sources of nutrients, especially in rural areas, where they suggestively raise daily consumption of minerals, vitamins, fiber, proteins, and other nutrients. Leafy vegetables have low energy thicknesses afterward recommended for weighing the board. Nutrients are important for human well-being and among the nutrients; L-ascorbic acid is an important micronutrient predictable for typical metabolic elements of the body. As a constituent of proteins that are engaged with the union of collagens and carnitine, L-ascorbic acid assumes a significant part. L-ascorbic corrosive is huge water-dissolvable cell support in the human body (Akbari, A. 2016). Minerals like iron (Fe), calcium (Ca), phosphorus (P), copper (Cu),

zinc (Zn), sodium (Na), and chloride (Cl) are tracked down in green, leafy vegetables.These minerals are important for growth, assimilation, and other processes. ,2019).The controlling parts found in green leafy vegetables are iron (Fe), calcium (Ca), potassium (K), sodium (Na), and so forth. The vitamins A, C, and K in dark lettuce are abundant; eating them consistently will work on your visual perception, bone well-being, and skin flexibility while assisting your blood with coagulating frequently (Buturi et al.,2021). New green vegetables are likewise great wellsprings of folic corrosive, which is expected for the increase and development of red cells. Cabbage is a brilliant wellspring of vitamin-C and vitamin-K, containing over 20% of the everyday incentive for every one of these supplements for each serving (Krishnaswamy et al., 2001). In addition, cabbage is a good source of folate, vitamin B6, and dietary fiber in a 100-gram serving. There are no other significant nutrients in cabbage. Dull green lettuces incorporate romaine lettuce (Lactuca sativa L. var. longifolia), arugula or taramira (Erucavesicaria), and margarine head lettuce (Lactuca sativa var. capitata). The majority of people use these nutrient-dense, slightly bitter, crisp leaves to make raw salads. Plants are significant sources of numerous bioactive mixtures altogether named as phytochemicals, which are reported to be vital to great well-being.Subsequently, phytochemicals can be comprehensively classified as wholesome parts (for instance, phenolic compounds, fundamental unsaturated fats, proteins, nutrients, minerals, etc). These days, underutilized food varieties are turning out to be increasingly more significant as a method for expanding how much food accessible per individual (Sharma et al.). , 2019).

Table no 1 - Nutritional compositions of some green leafy vegetables (per100gedibleportion).

Vegetables	**Macronutrients**					**Vitamins**				**Minerals**		
	Energy	Moisture	Protein	Fat	Carbohydrate	Thiamine	Riboflavin	Niacin	Ascorbic	Calcium	Phosphorus	Iron
Spinach	26.0	92.1	2.0	0.7	2.90	30	260	500	28	73	21	1140
Coriander	44.0	86.3	3.3	0.6	6.3	50	60	800	135	184	71	1420
Mintleaves	48.0	84.9	4.8	0.6	5.8	50	260	1000	27	200	62	1560
Fenugreek	49.0	86.1	4.4	0.9	6.0	40	310	800	82	395	51	1930
Bathua	30.0	89.6	3.7	0.4	2.9	10	140	600	35	150	80	4200

Cabbage	27.0	91.9	1.8	0.1	4.6	60	90	400	124	39	44	800
Amaranth	45.0	85.7	4.0	0.5	6.1	30	30	1200	99.0	397	83	3490
Drumstick	38.0	75.9	6.7	1.7	4.1	60	50	800	52	440	70	850

Nutritional components in green leafy vegetables:-

Dietary fiber:-

Green luxuriant vegetables have been usually seen as strange sources of dietary fiber There are epidemiological assertions that show that dietary fiber is huge in hindering a couple of sicknesses, particularly the fiber that is tracked down in leafy vegetables, for instance, celery, cabbage, spinach, and lettuce that is portrayed by high water content and an elevated degree of fiber. Also, it has been shown that fiber reduces the body's reabsorption of cholesterol, which is utilized to help with fat handling, carrying down cholesterol levels. Permitting to (Hanif et al., 2006). Cabbage, turnips, Brussels sprouts, and other members of the cabbage family may contain mixes that can prevent cancer. Spinach and cabbage are high-fiber vegetables. As established by the arrangement, Indian green leafy vegetables like basella, coriander, spinach, fenugreek, and cabbage are incredible wellsprings of dissolvable dietary fiber. The utilization of greater amounts of vital vegetable fiber caused in saves.

Minerals:-

This gathering incorporates spinach, lettuce, wavy lettuce, chard, chicory and so forth. From the given information in the table no1. It is shown that, these are significant minerals (iron and calcium), Nutrients (A, B-2, and C) and fiber sources. Additionally, this serving contains 20% of the DV for magnesium and 17% of the DV for iron. Magnesium assumes a part in north of 300 cycles in the human body. The zinc content of C. collection thinks about well to most qualities for green leafy vegetables announced in the writing . Zinc is necessary for the immune system to function normally. Shahi (1977) carried out two years' worth of field studies, which revealed that C. album contained a high concentration of N, P, K, Ca, Mg, Fe, and Mn. As the plant grew older, its nutrient content decreased. Guil Guerrero et al., 1997) announced high mineral items than in other green leafy vegetables.

Vitamins:- Green leafy vegetables contain b-carotene and leafy vegetables likewise an excellent wellspring of b-carotene. In leaves, vitamin An is available as provitamin A carotenoids like b-carotene (ca. 25-30 percent), b-cryptoxanthin, a-carotene, g-carotene, and the non-provitamin A carotenoids lutein (about 45%),violaxanthin 2(ca. 15%) and neoxanthin (ca. 15%) (Britton, 1996), the substance of vitamin An is communicated in retinol counterparts (RE) with one (1) RE being comparable to 6 µg of b-carotene and 12µg of the other expert nutrient carotenoids. The suggested everyday stipend (RDA) for vitamin An is likewise communicated in RE, yet the US has as of late altered its perspective. The term RE has been supplanted by the term "retinol action same" by the Foundation of Medication (RAE; IOM, 2001). The Foundation of Medication suggests 900 and 700 g RAE of vitamin A for a grown-up male and female, separately, in the dietary reference consumption (Trumbo et al., 2001).Cooking, bubbling, and steaming strategies critically affect the wealth of carotenoids in green leafy vegetables. A healthful examination of 30 broadly eaten green leafy vegetables showed that they contain a fair measure of lutein and are plentiful in various nutrients.

Anti-nutritional factors in green leafy vegetables:- Both cultivated and uncultivated plant species contain harmful chemical compounds known as anti-nutrients. These anti-nutrients are also known as allelo chemicals (Thakur et al., 2019). Plant genera and species have fluctuating amounts and conveyances of these synthetic mixtures. As per Cheek and Shull (Cheeke and Shull, 1985), being an enemy of healthful component is definitely not an intrinsic property of a compound, yet relies upon the stomach related course of the ingesting creature. The pattern of diet followed and the process by which the plant food is processed prior to consumption largely determine the degree of adversity. Nitrates, oxalates, tannins, phytates, and cyanogenic glycosides are a portion of the counter supplements ordinarily present in leafy vegetables. Nitrate: Nitrate is a characteristic compound found in vegetables that is liable for surveying the nature of the vegetables. Nitrate focuses in leafy vegetables are normally higher than in other vegetable sorts, like root and products of the soil (et al., 2010). The number, timing, and kind of nitrogen manure utilized, as well as ecological and hereditary variables, may all significantly affect nitrate levels in crude green leafy vegetables. An assessment of 10 leafy vegetables collected at two different light powers (200 and 400 mol m-2 s-1) tracked down that gathering at low light force (200 mol m-2 s-1) brought about higher nitrate amassing. How much nitrate in any vegetable per serving is non-harmful, yet

its metabolites and bi-items, for example, nitrinitric oxide, and N-nitrous mixtures, are the significant wellbeing concerns (Stops et al., 2008).

Phytic acid:-

Phytic acid, also known as myo-inositol hexaphosphoric acid, is a naturally occurring phosphorus storage compound found in all leafy vegetables (Nissar et al., 2017). Plant tissues contain potassium, magnesium, and calcium cation salts of phytic corrosive. According to Reddy and Sathe (2001), the large number of negatively charged phosphate groups in phytic acid makes important mineral nutrients in the body less accessible for absorption. Myo-inositol hexaphosphoric corrosive, a common phosphorus stockpiling compound, is present in all green vegetables. Cation salts of phytic corrosive found in plant tissues include calcium, magnesium, and potassium.

Leafy Greens vegetable Nutrient Powerhouses for Human Health:-

Leafy vegetables, encompassing a diverse array of plants such as spinach, kale, lettuce, and collard greens, have long been recognized for their exceptional nutritional content and potential contributions to human health. Packed with vitamins, minerals, fiber, and phytochemicals, these greens offer a myriad of health benefits that extend beyond mere culinary delight.

Nutrient Density: Leafy greens are renowned for their high nutrient density, providing an abundance of essential vitamins and minerals crucial for overall well-being. Rich in vitamins A, C, K, and various B-vitamins, as well as minerals like iron, calcium, magnesium, and potassium, these vegetables offer a nutritional boost with minimal calorie intake. The concentration of nutrients makes leafy greens an excellent choice for those seeking a nutrient-packed diet (Godswill *et al.,* 2020).

Antioxidant and Anti-Inflammatory Properties: Leafy greens are potent sources of antioxidants, including carotenoids, flavonoids, and polyphenols. These compounds play a pivotal role in combating oxidative stress, reducing inflammation, and protecting the body's cells from damage (Akbari *et al.,* 2022). Regular consumption of leafy greens has been associated with a decreased risk of chronic diseases such as heart disease and certain types of cancer.

Fiber Content and Digestive Health: A high-fiber diet is essential for maintaining digestive health, and leafy greens are exceptional sources of dietary fiber. Fiber aids in proper digestion, prevents constipation, and promotes a healthy gut microbiome. Moreover, the soluble fiber found in leafy greens can help regulate blood sugar levels and contribute to weight management (Kumar *et al.,* 2020).

Heart Health and Blood Pressure Regulation: Leafy greens have been linked to improved cardiovascular health due to their rich content of potassium, magnesium, and nitrate. These components contribute to lower blood pressure, reduced arterial stiffness, and improved blood vessel function (Bondonno *et al.,* 2014).Including leafy greens in the diet may thus be a key strategy for supporting heart health and preventing cardiovascular diseases.

Bone Health and Vitamin K: Leafy greens are particularly high in vitamin K, a crucial nutrient for bone health and blood clotting. Adequate vitamin K intake is associated with a reduced risk of fractures and improved bone mineral density. Incorporating leafy greens into one's diet can be especially beneficial for individuals looking to support skeletal strength and overall bone health **(Pearson, D. A. 2007).**

Conclusion: - This review underscores the significance of leafy vegetables in promoting human health through their rich nutritional profile and potential preventive effects against various diseases. The findings contribute to the existing body of knowledge, advocating for the incorporation of leafy greens into dietary guidelines and public health initiatives for a healthier global population.

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