Review

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Sweetpotatoes: The Super Food of the Next Century? An Intensive Review on Their Potential as a Sustainable and Versatile Food Source for Future Generations

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Abstract: This review article aims to delve into several aspects of sweetpotatoes and their leaves, including their nutritional composition, health benefits, culinary uses, and potential future implications as a superfood. It suggests an in-depth exploration of sweet potatoes' history, status, and prospects, highlighting their significance and potential economic value. Sweetpotatoes, often referred to as a powerhouse of nutrients, have gained popularity recently due to their remarkable nutritional composition and versatile culinary uses. This starchy root vegetable comes from the *Convolvulaceae* family and is consumed worldwide, playing a significant role in diverse cultures and cuisines. Besides their vibrant colors ranging from orange to purple, sweetpotatoes offer many health benefits, making them an essential addition to a well-balanced diet. Its extraordinary nutritional profile and numerous health benefits make it a superfood. Incorporating it into the diet can improve digestion, strengthen immunity, and reduce the risk of chronic diseases. With their versatility in the kitchen, there is no deficiency of charming and healthy recipes to explore. So, make room for sweet potatoes on your plate and unlock their vast potential to enhance your overall health and well-being. Overall, the future of sweetpotatoes looks bright as research and innovation aim to improve their nutritional value, adapt them to changing climate conditions, develop new varieties and products, and promote sustainable production practices. These developments can contribute to food security, economic growth, and healthier diets. Future research should focus on nutritional composition, health benefits, sustainable farming practices, cultivar development, and industrial applications to ensure sustainable and efficient production. By prioritizing research in these areas, we can enhance the utilization of sweet potatoes in various fields and secure their future for the next century.

Keywords: superfoods; sweetpotato; nutrition; bioactive compounds; production; industrial use; physiological functions; health benefits; medicinal value

1. Introduction

The sweet potato (Ipomoea batatas L. Lam.) is the world's seventh most important food crop [1]. This comes from the Convolvulaceae family and is consumed worldwide, playing a significant role in diverse cultures and cuisines. Besides their vibrant colors ranging from orange to purple, sweetpotatoes offer many health benefits, making them an essential addition to a well-balanced diet. The crop is gaining popularity in the United States as a healthy vegetable. Consequently, food companies must capitalize on the health aspect of this crop by producing value-added processed foodstuffs [2–6]. The per capita intake of the sweetpotato has increased about 56% from 2000 to 3 [7]. The increasing awareness of the health benefits of sweetpotatoes and their reputation as an alternative vegetable crop has been noticed by the food processors who have developed products that include sweet potato fries, puffs, wedges, crisps, sticks, pie, and mashed sweetpotatoes that are now available in many local stores [5,8–20]. Sweet potatoes are vegetatively propagated and

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susceptible to viruses and natural mutations that accumulate with each planting cycle (generation), leading to a decline in a variety [21]. This decline ultimately affects the yield, quality (changes in skin color, flesh color, and shape of potato roots), and crop marketability. This versatile and delicious vegetable has gained immense popularity recently due to its exceptional nutritional profile and various health benefits [2,3,6–8,14,15,17,19,20].

Sweetpotatoes are often considered a "superfood" due to their numerous health benefits and nutritional value. Here are some reasons why sweet potatoes are highly beneficial. They are rich in essential nutrients, including fiber, vitamins A, C, and B6, potassium, and manganese [2,3,6,19,20]. These nutrients are necessary for overall health and contribute to various bodily functions (22,23, 24,25]., Sweetpotatoes contain antioxidants like beta-carotene, which can help protect cells from damage caused by harmful free radicals [26,27,27,29,30,31.32,33,39,40]. Despite their sweet taste, sweetpotatoes have a relatively low glycemic index, meaning they do not cause a sharp increase in blood sugar levels [41–52]. The fiber content in sweet potatoes helps regulate blood sugar levels and can benefit individuals with diabetes or those looking to manage their blood sugar [53–60]. Despite their sweetness, sweetpotatoes have a moderate glycemic index due to their high fiber content. This allows for slower digestion and a gradual release of glucose into the bloodstream, preventing sudden spikes in blood sugar levels and making them suitable for individuals with diabetes or those aiming to manage blood sugar levels [53–56].

The fiber content in sweet potatoes contributes to a healthy digestive system by adding bulk to the stool, promoting regular bowel movements, and supporting the growth of beneficial gut bacteria [19,41,61–65]. Sweetpotatoes are an excellent source of potassium, a mineral that helps regulate blood pressure. Additionally, sweetpotatoes' antioxidants and other compounds may help reduce inflammation and lower the risk of heart disease [19,30,65]. These compounds have been linked to reducing the risk of chronic diseases, including certain types of cancer and cardiovascular diseases, by neutralizing harmful free radicals in the body [19,22,32,33,39–43]. The fiber content in sweetpotatoes adds bulk to meals, leading to increased feelings of fullness and reduced calorie intake. This can aid in weight management and promote healthy weight loss. The high fiber content in sweetpotatoes also aids in promoting digestive regularity and preventing constipation. Additionally, resistant starches act as prebiotics, nourishing the beneficial gut bacteria and supporting a healthy gut microbiome [66–72]. Sweetpotatoes' high beta-carotene content benefits eye and others health conditions [66–68]. The beta-carotene is converted into vitamin A within the body. This nutrient, critical for maintaining good vision, helps prevent age-related macular degeneration and other eye-related conditions. It may reduce the risk of age-related macular degeneration and help maintain good vision. The vitamins C, A, B, K, E content in sweetpotatoes supports immune function and helps the body fight off infections and illnesses [6,10,19,24,28–30,35–37,73–75]. Moreover, they have a relatively low glycemic index, making them a suitable choice for individuals looking to manage their blood sugar levels [48–52,76]. These vitamins in sweetpotatoes, strengthens the immune system and assists in collagen synthesis, wound healing, and fighting off infections and viruses [6,66–68].

Sweetpotato leaves possess high levels of antioxidants, such as beta-carotene, lutein, and zeaxanthin. These compounds protect the body against oxidative stress caused by free radicals. They are linked to a reduced risk of chronic diseases, including heart disease, inflammation, and certain types of cancer [19,30,77–88]. The high potassium content in sweetpotato leaves promotes cardiovascular health by helping to regulate blood pressure levels. Potassium counteracts the effects of sodium, reducing the risk of hypertension, stroke, and heart disease. They are an excellent source of dietary fiber, promoting digestive health. Fiber aids in maintaining regular bowel movements, preventing constipation, and supporting a healthy gut microbiome [70–72]. The presence of bioactive compounds like polyphenols and flavonoids in sweetpotato leaves translates to potential anti-inflammatory effects. These compounds help reduce inflammation and may benefit individuals with arthritis, asthma, and inflammatory bowel disease [4,6,19,30,32,33,73,89–96]. Sweetpotato leaves contain unique bioactive compounds that have shown promise in regulating blood sugar levels. These compounds can improve insulin sensitivity and glycemic control, making sweet potato leaves a valuable dietary addition for individuals with diabetes or those aiming to manage blood sugar

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levels [23,26,48–52,97,98]. Sweetpotato leaves can be cooked and enjoyed in various ways [99–106]. They taste slightly earthy, like spinach or Swiss chard, and pair well with multiple ingredients. Sweet potato leaves can be used in stir-fries, sautés, soups, stews, curries, and salads. They can also be added to pasta dishes and omelets or used as a filling in pies and wraps. Sweet potato leaves can be juiced or blended into smoothies for a nutritional boost.

As awareness of sustainable food practices and the importance of plant-based diets grows, sweetpotato leaves hold significant potential [19,30,31,33,47]. They are highly nutritious and can provide a sustainable alternative to other leafy greens. Cultivating and utilizing sweetpotato leaves can diversify our food sources and help address food security issues and nutritional deficiencies in certain regions. Sweet potato leaves, often neglected, deserve recognition as a nutritional powerhouse. Packed with essential vitamins, minerals, fiber, and antioxidants, they offer a range of health benefits. Incorporating sweetpotato leaves into our diets supports heart health, digestion, and blood sugar regulation and provides anti-inflammatory benefits. With their versatility in the kitchen, sweet potato leaves can be used in various dishes, adding a delicious and nutritious touch. Moreover, their potential as a sustainable crop makes them an attractive candidate for future agricultural practices. So, let's embrace sweetpotato leaves' nutritional benefits and explore their culinary possibilities. Sweetpotato tops can be utilized as a sustainable food source [2,3,5,19,24,30,41,82,91,100,107,108]. With their high nutritional value, sweet potatoes can contribute to food security, especially in regions where they are grown abundantly. Moreover, their versatility and availability make them an accessible option for incorporating nutrient-rich greens into diets worldwide.

Therefore, sweetpotatoes both tuber and leaves are incredibly versatile in the kitchen and can be prepared in many ways. They can be boiled, steamed, roasted, baked, or grilled, bringing natural sweetness and enhancing flavor. Sweetpotato fries, baked sweetpotato wedges, mashed potatoes, and casseroles are famous. Sweet potatoes can also be used as a base for soups, stews, and curries, adding richness and depth of flavor. Additionally, they can be included in salads, stir-fries, and even desserts like sweetpotato pie or bread, providing a unique twist to conventional recipes. Sweetpotatoes are a versatile and delicious crop that has gained immense popularity recently due to their exceptional nutritional profile and various health benefits in leaves and tuber. It often referred to as a powerhouse of nutrients, have gained popularity recently due to their remarkable nutritional composition and versatile culinary uses. This review article aims to delve into several aspects of sweetpotatoes, including their nutritional composition, health benefits, culinary uses, and potential future implications as a superfood.

2. Origins and Varieties

The sweetpotato (*Ipomoea batatas* L. Lam.) is a versatile and nutritious plant enjoyed worldwide. It is a dicotyledonous plant belonging to the Convolvulaceae family. It is a new world crop. However, there is still some misperception that exists in its origin and primary & secondary centers of diversity [109,110]. Several authors described the origin of these crops and their centers of diversity [109–115]. It has become increasingly popular due to its exceptional nutritional value and culinary versatility. This introduction will explore sweet potatoes' origins, varieties, nutritional composition, and culinary uses.

Origins and Varieties: The sweetpotato is believed to have originated in Central and South America thousands of years ago. It then spread to other regions through trade and exploration. Today, it is cultivated in various countries, including China, India, Vietnam, and the United States.

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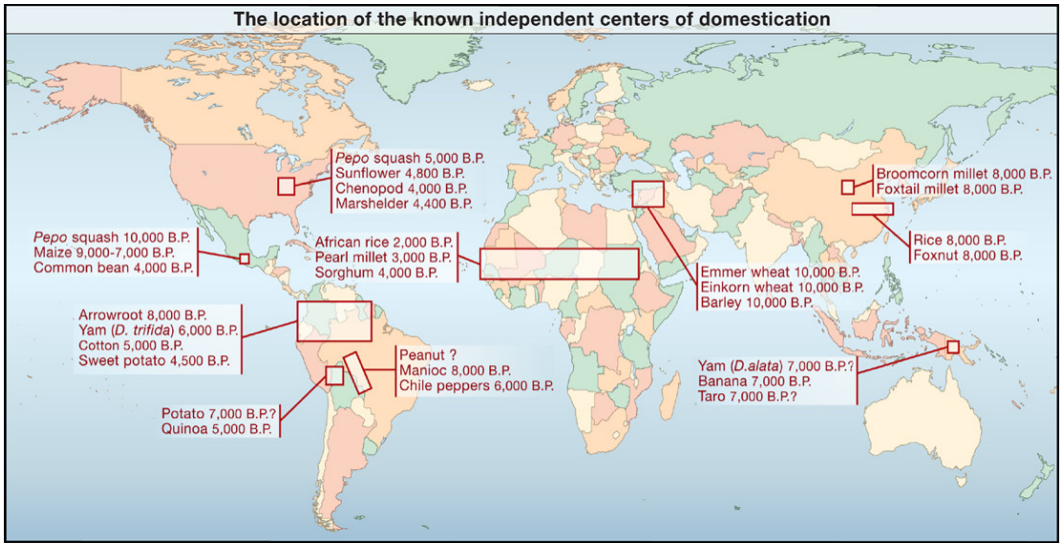

Figure. There are different varieties of sweet potatoes, each with its unique characteristics. Some common varieties include orange-fleshed sweet potatoes, which are rich in beta-carotene and vitamin A. There are also purple-fleshed sweet potatoes, which get their vibrant color from antioxidants called anthocyanins. White-fleshed sweet potatoes have a milder taste and are often used in savory dishes.

2.1. Production Technology

When implementing sweet potato production technology, it's crucial to consider the specific climatic conditions, soil type, and local practices. Consulting with agricultural experts or local extension services can provide valuable guidance tailored to the region. The production technology of sweet potatoes involves several key steps. Here is an overview of the process [116–119]. Growing sweetpotato leaves is relatively straightforward and can be done on a small or large scale. Following good agricultural practices, providing adequate care, and monitoring for any pests or diseases that may affect the crop is essential. The production technology for sweet potato leaves, also known as sweet potato tops or greens, involves the following steps [19.31,120].

2.2. Land Preparation

Begin by selecting a suitable site with well-drained soil rich in organic matter. Clear the land of any weeds or crop residues, and plow or till the soil to prepare a suitable seedbed [116–119]. For leaves, prepare the land by clearing it of weeds and debris. Till or plow the soil to create a well-drained seedbed. Sweetpotato leaves can be grown in both open fields and containers.

2.3. Variety Selection

When selecting sweet potatoes, consider climate, soil conditions, and market preferences. There are orange, purple, and white varieties. If you want to produce leaves, choose edible varieties like 'Ace of Spades,' 'Yanomami,' and 'Centennial.' Popular cultivars in the US include Beauregard, Covington, Jewel, Garnet, Japanese, and Purple. Each has unique characteristics and culinary uses [2,100,116–119,121,123]. For example, Beauregard is sweet and moist, Covington is great for baking, and Garnet is perfect for casseroles. Japanese sweet potatoes have a nutty flavor and are versatile in the kitchen. In the United States, several different cultivars of sweet potatoes are grown, each with unique characteristics and culinary uses [121,122]. Purple sweet potatoes are high in antioxidants and are used in desserts.

2.4. Types of Leaves

Sweetpotato leaves are highly nutritious and come in many varieties used in cuisines worldwide. Traditional and red-stemmed varieties are commonly used in African, Southeast Asian,

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and Caribbean cuisines. Japanese sweet potato leaves are popular in Japanese dishes. Like spinach, white-stemmed sweet potato leaves are used in African and Caribbean cuisines. Purple sweet potato leaves are rich in antioxidants and add color and nutrition to salads, stir-fries, and soups. Try sweet potato leaves for a delicious and healthy meal [19,30,31,107,124].

2.5. Seed Preparation

Sweetpotato production commonly involves planting vine cuttings instead of seed tubers. Select healthy and disease-free vines for propagation. Cut the vines into 12-18-inch segments, ensuring each cutting has at least two nodes [116–119].

2.6. Planting

Plant the vine cuttings in prepared beds or ridges. Insert the cuttings into the soil, leaving nodes exposed above the ground. Space the cuttings about 12-18 inches apart, with rows spaced 2-3 feet apart. To produce leaves, take stem cuttings from healthy sweet potato plants or purchase them from a reputable source. Cuttings should be about 8-10 inches long and have 2-3 nodes. Insert the cuttings into the soil, burying them about 4-6 inches deep. Space the cuttings around 12-18 inches apart in rows 3-4 feet apart [116–119].

2.7. Crop Management

Provide proper care and management throughout the growing season. This includes regular irrigation to maintain soil moisture, weed control to minimize competition, and fertilization to supply nutrients based on a soil test and crop requirements. Sweetpotato leaves require regular care and management throughout the growing season to produce leaves. Irrigate the plants regularly to keep the soil consistently moist but not soggy. Weed the field to minimize competition for nutrients and sunlight. Fertilize as needed based on soil tests and crop requirements [116–119].

2.8. Harvesting

When harvesting sweet potatoes, it's important to wait until the leaves turn yellow and begin to wither before digging them up. This usually happens around 100-140 days after planting, depending on the variety and growing conditions. Before harvesting, cut back the vines to ground level a few days before to make it easier to access the sweet potatoes. When digging, start about 12 inches away from the base of the plant to avoid damaging the tubers. Carefully lift the sweet potatoes from the ground to avoid bruising or injuring them. After harvesting, it's important to handle the sweet potatoes with care to prevent damage and bruising. Avoid dropping or piling them on top of each other, as this can lead to bruising, rot, or excessive moisture buildup. Sweet potatoes are typically cured in a warm, well-ventilated area with high humidity (around 85-90%) for 10-14 days to improve flavor, texture, and storage life. This allows them to heal minor cuts and bruises, convert starches to sugars, and develop their characteristic sweet taste. Sweet potato leaves can be harvested throughout the growing season, starting around 4-6 weeks after planting. Harvest the young tender leaves by cutting them from the stem using a sharp knife or scissors. After harvesting, sort the sweet potatoes by size, removing any damaged or diseased tubers. If applicable, grade them based on size and quality for market or personal use [116–119].

2.9. Storage

Sweetpotatoes need proper curing and storage conditions to maintain quality. For adequate storage of sweet potatoes, cure them in a warm and well-ventilated area with high humidity for 10-14 days, then store them in a cool, dry, and dark place with a temperature between 55-60°F and relative humidity of 85-90%. To extend their shelf life, keep them in a single layer with proper ventilation, check for damaged or spoiled ones, handle them with care, and monitor regularly. Proper post-harvest handling is crucial for maintaining their quality [116–119].

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2.10. Post-Harvest Handling

Sorting and grading the harvested sweet potatoes is necessary to remove damaged or diseased tubers. Pack the sweet potatoes in appropriate containers for storage or transport to the market, ensuring proper ventilation and protection against mechanical damage. In case of leaves, sort and clean the leaves to remove any debris or damaged material. Sweet potato leaves are highly perishable, so it's best to use them fresh. If storing is necessary, store them in a cool, humid place or wrap them in damp paper towels and place them in a plastic bag in the refrigerator [105,116–118,120,121,124–127].

2.11. Transportation

When transporting sweetpotatoes, taking specific steps to ensure their safety and quality is essential [9,128–130]. Here are some guidelines to follow:

1. Use sturdy containers or crates with cushioning material to prevent damage.
2. Secure the load with straps or ropes and padding between layers.
3. Keep sweet potatoes at the right temperature and properly ventilated.
4. Handle them gently to avoid bruising.
5. Monitor sweet potatoes during transit for signs of damage or spoilage

Sweet potatoes are sensitive to extreme temperatures. If transporting in hot weather, keep the sweet potatoes in a shaded or air-conditioned space to prevent them from overheating. Protect them from freezing temperatures in colder weather by insulating the containers [137,138]. These simple steps will help ensure the safe and successful transportation of sweetpotatoes [131–136].

2.12. Processing

Sweetpotatoes can be processed in various ways for different uses. These methods include cleaning and sorting, cutting or slicing, cooking or boiling, mashing or pureeing, drying, freezing, canning or preserving, roasting or frying, baking or cooking, and industrial processing. The actual process may vary based on the desired end-use or product being produced [18,39,93,105,108,118,124,125,137,138].

2.13. Packaging

Sweetpotatoes need proper packaging to maintain their quality and shelf life and protect them from damage. Standard packaging methods include mesh bags, cartons/boxes, plastic containers, plastic film wrapping, bulk packaging, modified atmosphere packaging, and labeling/branding. Packaging regulations and consumer preferences may vary based on regional or national requirements. Sustainable packaging options are also being considered to minimize environmental impact [105,106,113,132,133,140–143]

2.14. Insects and Pests

Pests commonly affecting sweet potatoes include the sweet potato weevil, wireworms, aphids, whiteflies, moths, and beetles. To control these pests, inspect and discard infested potatoes, use pheromone traps, implement cultural practices like crop rotation and deep plowing, use insecticides or biological control agents, apply insecticidal soap or neem oil, use yellow sticky traps, and maintain cool temperatures with sufficient ventilation during storage [144–148]. Adopting integrated pest management practices that include cultural, biological, and chemical control methods is essential to manage insect and pest infestations effectively. Regular monitoring, early intervention, and seeking guidance from agricultural experts or local extension services can help prevent infestations from becoming significant problems.

2.15. Diseases

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Sweetpotatoes can be vulnerable to several destructive diseases [149–153]. Here are some common sweet potato diseases and assertive management strategies to control them: 1. Sweet potato wilt: This fungal disease is caused by Fusarium species that can cause wilting, stunting, and yellowing of leaves. Control it by using resistant varieties, crop rotation, and treating the seed with fungicides. 2. Sweet potato leaf curl: A viral disease spread by whiteflies that causes leaf curling, yellowing, and stunted growth. Control it by using disease-resistant varieties and aggressively controlling whiteflies. 3. Sweet potato scab: A bacterial disease that causes raised, corky lesions on the skin of sweet potatoes. Control it by using copper-based fungicides, practicing good crop rotation, and planting disease-free seed potatoes. 4. Black rot: A bacterial disease that causes black, foul-smelling decay in sweet potatoes. Prevent its spread by ensuring proper storage conditions, regularly inspecting the potatoes, and immediately removing any infected tubers. 5. Sweet potato virus disease (SPVD): Caused by a complex of viruses that result in stunted growth, distorted leaves, and reduced yields. Control it by planting virus-free seed potatoes, aggressively controlling insect vectors, and practicing thorough sanitation. 6. Stem rot: A fungal disease that causes the rotting of stem tissues, resulting in wilting and plant death. Control it by using resistant varieties, providing excellent drainage, and avoiding excessive irrigation. Prevention is crucial in managing sweet potato diseases. Use only disease-free seed potatoes, practice crop rotation, maintain impeccable sanitation, and implement cultural practices that promote plant health.

2.16. Marketing

By implementing these marketing strategies, you can increase awareness and demand for the sweetpotatoes, ultimately driving sales and building a loyal customer base [105,106,113,132,133,140]. Several strategies can help promote your product and reach the target audience when marketing sweet potatoes. Here are some marketing ideas for sweet potatoes:

(i) Develop a strong brand identity.
(ii) Highlight their unique qualities and health benefits.
(iii) Utilize social media.
(iv) Set up a booth at farmers' markets or participate in local food events.
(v) Collaborate with local restaurants, chefs, or food bloggers.
(vi) Develop a professional website
(vii) Offer tastings and cooking demonstrations.
(viii) Create eye-catching packaging with clear information.
(ix) Partner with local grocery stores or specialty food shops.
(x) Encourage customer testimonials and reviews.

2.17. Cost of Production

The cost of producing sweet potatoes involves several factors that farmers need to consider. The main expenses include land and rent, seed and planting material, labor, fertilizers and inputs, irrigation, machinery and equipment, storage and packaging, nutritional analysis, pest and disease analysis, quality analysis, shelf life and storage analysis, and allergen analysis. Farmers should consult a reputable analytical laboratory and obtain a detailed quote to get an accurate cost estimation [154–159]. They should also consider market research, transportation, and marketing expenses.

3. Nutritional Composition

3.1. Vimamins

Sweet potatoes are not only delicious but also packed with essential nutrients. They are an excellent source of dietary fiber, which aids in digestion and promotes a healthy gut. They are also rich in vitamins, including vitamins A, C, E, K and B vitamins [2–4,19,30,35–37,94]. Sweet potatoes are an excellent source of potassium, magnesium, and manganese minerals. Furthermore, they contain antioxidants that help reduce inflammation and protect against chronic diseases.

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3.2. Minerals

Sweet potatoes are an excellent source of essential minerals, including potassium, manganese, copper, iron, magnesium, and zinc. These minerals are vital in maintaining good health by supporting cardiovascular, nerve, and muscle function, metabolizing nutrients, and protecting cells from damage. Incorporating sweet potatoes into your diet, whether baked, boiled, or roasted, can provide a range of minerals that support overall health and well-being [94,160–166]

4. Physiological Functions of Sweetpotato Storage Root and Leaves

4.1. Antioxidant Capacities

The antioxidant capacities of sweet potatoes can vary depending on their color and variety. Purple-fleshed sweet potatoes have higher anthocyanin content and antioxidant activity than orange-fleshed varieties. However, all sweetpotatoes offer various antioxidants contributing to their health-promoting properties [4,19,22,24,30,33,41,45,75,85,86,91,167–172]. They are known for their high antioxidant content, attributed to their vibrant colors, particularly in purple and orange-fleshed varieties. Here are some essential antioxidants found in sweet potatoes and their benefits:

Beta-carotene: Sweet potatoes are rich in beta-carotene, a type of carotenoid that gives them their orange color. Beta-carotene is converted into vitamin A and acts as a powerful antioxidant, protecting cells from oxidative stress and supporting eye health [66–68,173–175].

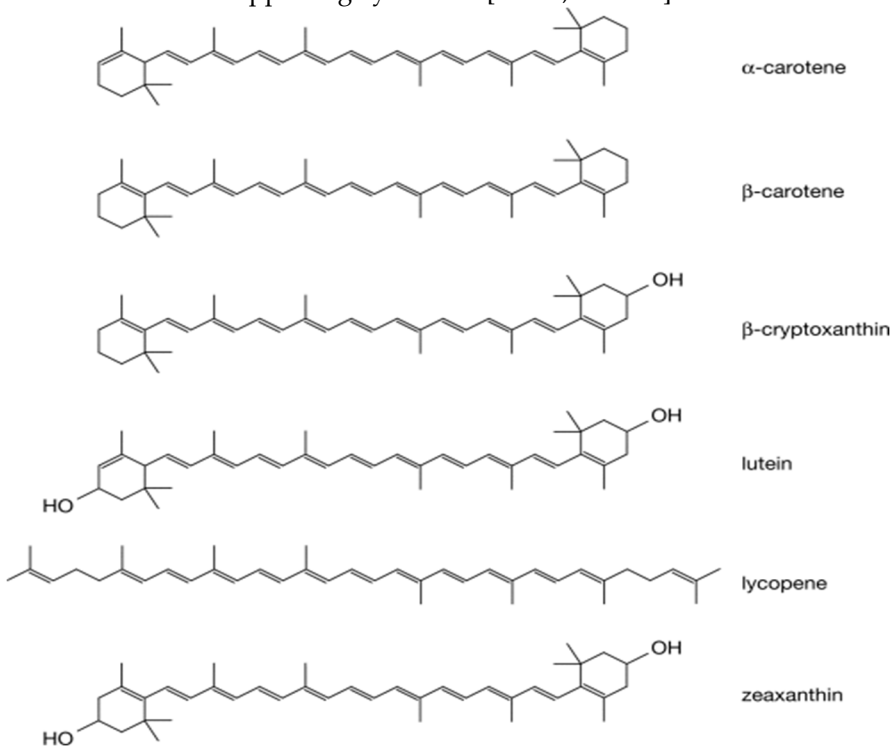

Figure 1. Chemical structures of the six most prevalent carotenoids (α-carotene, β-carotene, β-cryptoxanthin, lutein, lycopene, and zeaxanthin) in the human diet.

4.2. Anthocyanins

Purple-fleshed sweetpotato tubers and leaves contain anthocyanins, potent antioxidants responsible for their vibrant color. Anthocyanins have various health benefits, such as reducing inflammation, boosting cardiovascular health, and supporting brain function [33,169,171,176–187]. Sweetpotatoes, contain anthocyanins, a group of pigments responsible for their vibrant colors. The specific anthocyanin compositions in sweet potatoes can vary depending on the variety and growing conditions, but some common anthocyanins are found in purple-fleshed sweet potatoes. Sweet potato leaves also contain anthocyanins, although their specific composition may differ from that of the sweet potato tubers. The anthocyanin profiles in sweet potato leaves depend on factors such as the

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variety, growing conditions, and maturity of the leaves. Here are some common anthocyanins that can be found in sweetpotato leaves:

Anthocyanin	R_1	R_2	R_3	Mf		Mw	Aglycon	
YGM-0a	H	H	H	$C_{33}H_{41}O_{21}$	773.67		Cy	
YGM-0b	CH_3	H	H	$C_{34}H_{43}O_{21}$	787.70		Pn	
YGM-0c*	H	ND	ND	$C_{40}H_{45}O_{23}$	893.78		Cy	
YGM-0d*	H	ND	ND	$C_{42}H_{47}O_{24}$	935.82	Cy		
YGM-0e*	CH_3	ND	ND	$C_{41}H_{47}O_{23}$	907.81		Pn	
YGM-0f*	CH3	ND	ND	$C_{42}H_{49}O_{24}$	937.83		Pn	
YGM-0g*	H	ND	ND	$C_{43}H_{49}O_{24}$	949.84		Cy	
YGM-1a	H	PHB	Caf	$C_{49}H_{51}O_{26}$	1055.92		Cy	
YGM-1b	H	Caf	Caf	$C_{50}H_{53}O_{27}$	1085.95		Cy	
YGM-2	H	H	Caf	$C_{42}H_{47}O_{24}$	935.82	Cy		
YGM-3		H	Fer	Caf	$C_{52}H_{55}O_{27}$	1111.99	Cy	
YGM-4b	CH_3	Caf	Caf	$C_{52}H_{55}O_{27}$	1111.99		Pn	
YGM-5a	CH_3	PHB	Caf	$C_{50}H_{53}O_{26}$	1069.95		Pn	
YGM-5b	CH_3	H	Caf	$C_{43}H_{49}O_{24}$	949.84		Pn	
YGM-6		CH_3	Fer	Caf	$C_{53}H_{57}O_{27}$	1126.02		Pn

YGM Yamagawamurasaki; Cy, Pn cyanidin, and peonidin, respectively. PHB, Caf, Fer= *p*-hydroxybenzoic, caffeic and ferulic acid, respectively; ND =not determined; Mf= molecular formula of flavylium cation; Mw= molecular weight calculated as flavylium cation; *The chemical structures of these anthocyanins have been partially determined.

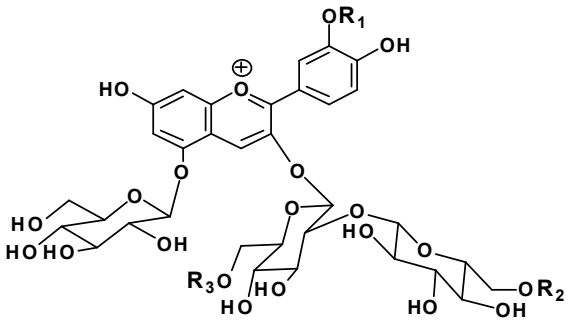

Figure 2. Chemical structures and characteristics of the anthocyanin compositions in sweetpotato leaves [46].

Cyanidin: Cyanidin is one of the main anthocyanins found in purple-fleshed sweet potatoes. It gives fruits and vegetables their red, purple, or blue hues. Cyanidin has various health benefits, including antioxidant and anti-inflammatory properties.

Peonidin: Peonidin is another anthocyanin commonly found in purple-fleshed sweet potatoes. It contributes to the red and purple colors of fruits and vegetables. Peonidin has antioxidant and anti-inflammatory properties and has been studied for its potential health benefits.

Delphinidin: Delphinidin is a blue anthocyanin that can also be found in purple-fleshed sweet potatoes. It is known for its antioxidant activity and has been investigated for its potential protective effects against chronic diseases.

Malvidin: Malvidin is a purple anthocyanin often present in purple-fleshed sweet potatoes. It contributes to their dark purple color and has been studied for its potential health benefits, including antioxidant and anti-inflammatory effects.

These are just a few examples of the anthocyanins in purple-fleshed sweetpotatoes. The specific anthocyanin profile may vary among different varieties and depending on factors such as growing conditions and maturity of the sweetpotatoes. Eating purple-fleshed sweetpotatoes can provide

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various anthocyanins associated with multiple health benefits, including antioxidant and anti-inflammatory effects. Some examples of anthocyanins can be found in sweetpotato leaves, but the specific composition may vary depending on various factors. Sweetpotato leaves are an edible green leafy vegetable rich in nutrients and antioxidants, including anthocyanins, contributing to their potential health benefits.

4.3. Caffeic Acid Derivatives

Sweet potatoes contain the phenolic compound caffeic acid, which possesses antioxidant and anti-inflammatory properties. Caffeic acid is believed to have potential benefits in combating oxidative stress and reducing the risk of chronic diseases, including heart disease and cancer [19,30,33,42,45,61,88,91,169,188,189].

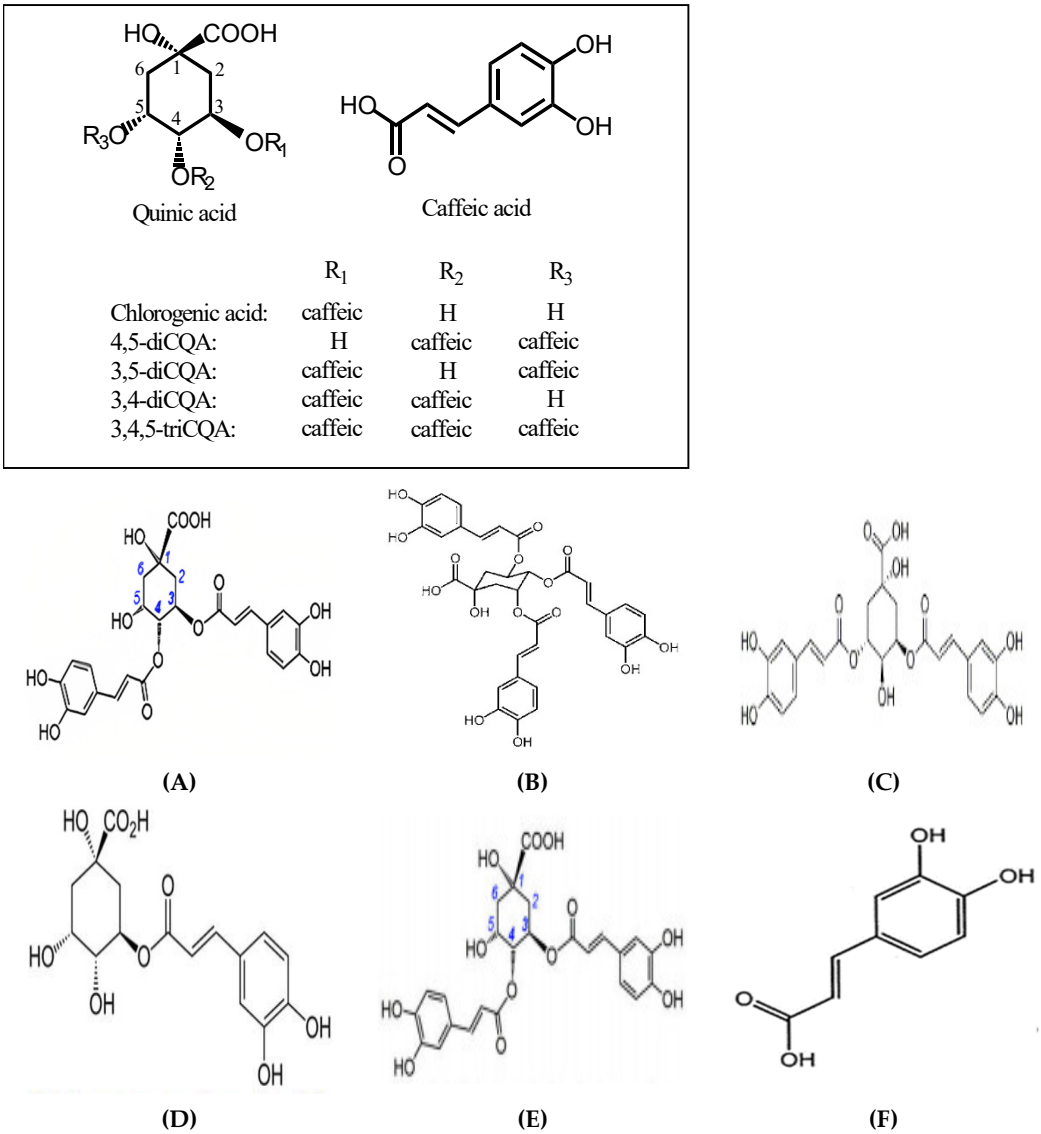

Figure 3. Chemical structures of polyphenolic compounds in sweetpotato leaves. A. Chlorogenic Acid B. 3,5-Di-caffeoylquinic acid C. 3,4-Di-caffeoylquinic acid D. 4,5-Di-caffeoyalquinic acid E. 3,4,5-tri-o-caffeoylquinic acid, and F. Caffeic acid [42].

It's important to note that cooking methods can influence the antioxidant content of sweet potatoes. Boiling and steaming are recommended as they help retain more antioxidants than frying or baking at high temperatures. Incorporating a variety of sweet otatoes into your diet can provide a range of antioxidants, supporting overall health and well-being.

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4.4. Anti-Diabetic Potential of Sweetpotatoes

Sweet potatoes can be advantageous for individuals with diabetes due to their anti-diabetic properties. They have a relatively low glycemic index, which helps maintain stable blood glucose levels. Sweet potatoes are also a great source of dietary fiber, especially soluble fiber, which regulates blood sugar levels and improves insulin sensitivity. They contain resistant starch, which improves insulin sensitivity and enhances overall glycemic control. Additionally, sweet potatoes are abundant in antioxidants such as anthocyanins, which reduce oxidative stress, inflammation, and insulin resistance, enhancing blood sugar control [32,48–53].

4.5. Anti-Inflammatory Activity of Sweetpotatoes

Sweet potatoes and their leaves, also known as sweet potato tops or greens, have been studied for their anti-inflammatory properties. They contain polyphenols, antioxidants, vitamins, minerals, and omega-3 fatty acids, all contributing to their anti-inflammatory effects. Polyphenols like phenolic acids and flavonoids exhibit anti-inflammatory properties by inhibiting pro-inflammatory enzymes and reducing the production of inflammatory cytokines. Antioxidants help neutralize free radicals and reduce oxidative stress, thereby reducing inflammation in the body. Sweet potato tops are rich in essential vitamins and minerals like vitamins C, E, beta-carotene, and fiber, which can help modulate the immune response and reduce inflammation. Additionally, sweet potatoes are a great source of beta-carotene, which has anti-inflammatory effects, and vitamin E, another anti-inflammatory antioxidant, helps manage inflammation [6,73,89,91].

4.6. Anticancer Potential of Sweetpotatoes

Sweet potatoes have been studied for their potential anti-cancer properties. They contain compounds such as anthocyanins and phenolic compounds that have anti-inflammatory effects. Chronic inflammation is known to increase the risk of cancer, and these compounds may help reduce inflammation and lower the risk of cancer development. Sweet potato leaves are rich in antioxidants like flavonoids and phenolic compounds that can protect cells from oxidative stress and DNA damage. This can help prevent the development of cancer. Studies suggest that sweet potato leaves contain substances that can induce apoptosis in cancer cells, potentially inhibiting their growth. They also exhibit anti-proliferative effects by slowing down cancer cell growth and division. Sweet potato leaves contain compounds that can modulate immune responses, potentially enhancing the body's ability to recognize and destroy cancer cells. Sweet potatoes are high in dietary fiber, which can promote regular bowel movements and assist in the elimination of potential carcinogens from the body. Additionally, sweet potatoes have a lower glycemic index than other starchy foods, which can help control blood sugar levels and reduce the risk of certain cancers, such as breast, colorectal, and endometrial cancer [4,19,31,32,61,77–80].

4.7. Antimutagenic Properties in Sweetpotatoes

Sweetpotatoes have the potential to reduce mutations in DNA which can lead to cancer. This property is known as antimutagenicity. Sweet potatoes are rich in dietary fiber, antioxidants, phytochemicals, and anthocyanins, all of which have been shown to have antimutagenic properties. Additionally, they can increase the activity of detoxification enzymes in the body and possess anti-inflammatory effects, inhibiting tumor growth and reducing mutagenesis. Boiling and steaming sweet potatoes better preserve their antioxidant and antimutagenic activity than frying or baking [19,30,33,47,82,91,190].

4.8. Anti-Microbial Activity

Sweetpotatoes possess potent antimicrobial properties that can inhibit the growth of various microbes. The roots, leaves, and stems of sweetpotatoes contain antibacterial and antifungal compounds such as polyphenols, anthocyanins, and proteins that offer protection against pathogenic bacteria and fungi. Studies suggest that sweet potatoes may also possess antiviral activity against

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certain viruses, such as influenza and herpes simplex. However, further research is needed to understand the specific mechanisms behind this antiviral activity. Including sweet potatoes in your diet is an excellent way to enhance your health and protect against harmful microbes [19,30,77,191–196].

4.9. Cardiovascular Potential of Sweetpotatoes

Sweet potatoes are a heart-healthy food with several potential cardiovascular benefits: - Antioxidant activity: Sweet potatoes are rich in antioxidants that help reduce oxidative stress and inflammation, which are linked to cardiovascular diseases. Blood pressure regulation-sweetpotatoes are a good source of potassium, which helps maintain healthy blood pressure levels; blood sugar regulation-sweetpotatoes have a low glycemic index, making them beneficial for individuals with diabetes or those at risk of developing it, anti-inflammatory effects- it contain anti-inflammatory compounds that may protect against cardiovascular damage, fiber content- sweetpotatoes are an excellent source of dietary fiber, which can help reduce the risk of heart disease. Incorporating sweet potatoes into the diet is a tasty and simple way to support your heart health. [197–202].

Table 1. Individual health beneficial functions of sweetpotatoes.

Physiological Function	**Related components**	**References**
Antioxidative activity/ Radical scavenging activity (Leaves & tuber)	Polyphenol, anthocyanin	[19,22,24,30,33,41,45,85,86,91,168–172,245]
Antimutagenicity (Leaves & tuber)	Polyphenol, anthocyanin	[19,30,33,47,82,91,190,250]
Anticarcinogenesis (Leaves & tuber)	Polyphenol, anthocyanin	[19,30,31.203,204,205,246,252,253]
Antihypertension (Leaves & tuber)	Polyphenolics, anthocyanin	[19,30,109,190,206]
Antimicrobial activity (Leaves & tuber)	Fiber, pectin-like polysaccharide	[19,30,77,109,190,206]
Antiinflammation (tuber)	Polyphenol,Anthocyanin	[19,30,91,190,206,247]
Antidiabetic effect (Leaves & tuber)	Anthocyanin, polyphenol	[19,30,207–210]
Enhanced Immune Function (Leaves & tuber)	Vitamin A and C	[19,30,35–37,41,66–68,212,213]
Cancer Prevention (Leaves & tuber)	Antioxidant, anti-inflammatory, Bio-active compounds	[19,30,77–80,248,249,254]
Digestive Health (Tuber)	Dietary fiber	[19,30,96,190]
Anti-HIV (Leaves & tuber)	Caffeic Acid Derivatives	[19,30,217]

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Promotion of Bifidobacterium growth (Leaves & tuber)	Dietary fiber. Jalapin	[19,30,77,190]
Gut Health (Leaves & tuber)	Dietary fiber	[70–72,96,190,218,255].
Improved Blood Sugar Control (tuber)	Acidic Glycoprotein	[19,48–53]
Reduction of liver injury (tuber)	Polyphenol	[206,247]
Relief from constipation (tuber)	Dietary fiber, jalapin	[89,96,190,218]
Eye health (Leaves & tuber)	Beta carotene Vitamin A	[19,89,173–175,251]
Skin Health (Leaves & tuber)	Vitamin C Collagen production	[22,24,221,223,225]
Weight measurement (Leaves & tuber)	Dietary fiber, jalapin	[94–96]
Obesity (Leaves & tuber)	Fiber, Phytonutrients	[19,30,94–96,190]
Heart Health (Leaves & tuber)	Dietary fiber, Potassium Antioxidant, anti-inflammatory	[19,30,197–202]
Modulation of enzymes (Tuber)	Metabolic enzyme cytochrome P450	[8,226–230]
Detoxification enzymes: (Tuber)	Glutathione S-transferase Quinone reductase	[231–234]
Glycemic index (Tuber)	Fiber, Glycoprotein	[235–237]

4.10. Obesity

Sweetpotatoes are a great addition to a healthy weight management plan. They are rich in dietary fiber, low in calories, and have slow-release carbohydrates. They are also packed with essential vitamins and minerals. Research suggests that consuming whole, unprocessed foods like sweet potatoes can help reduce the risk of overeating. However, moderation is vital, and it's essential to combine sweet potatoes with other nutrient-rich foods and engage in regular physical activity to achieve and maintain a healthy weight. Consult a healthcare professional or a registered dietitian for personalized advice regarding individual nutrient needs and dietary restrictions [220–224].

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4.11. Brain Function

Sweetpotatoes are a nutritious food that can significantly benefit brain function. They contain antioxidants and anti-inflammatory compounds that protect the brain from oxidative stress, reduce inflammation, and support overall brain health. Additionally, sweet potatoes are a great source of essential nutrients like vitamins C, E, and potassium. They have a low glycemic index, so they release energy slowly and maintain stable blood sugar levels, which is crucial for optimal brain function [176–178]. Furthermore, they are high in fiber, which supports a healthy gut microbiome linked to cognitive function. Remember, a balanced diet and healthy lifestyle are critical for optimal brain function.

4.12. Healthy Vision

Sweetpotatoes are great for healthy vision. They contain beta-carotene, converted into vitamin A, lutein, and zeaxanthin that protect the eyes. Sweet potatoes are also rich in antioxidants and anti-inflammatory compounds and have a lower glycemic index, which all contribute to maintaining good vision. Incorporating sweet potatoes into a balanced diet can help, but overall eye health also depends on regular eye exams, protecting the eyes from UV rays, and adopting a healthy lifestyle. Consult an optometrist or ophthalmologist if you have specific vision concerns [173–175].

4.13. Immune System

Sweetpotatoes are great for the immune system due to their nutrient content and antioxidants. They're rich in vitamins A and C, which boost the immune system and support the production of white blood cells. Sweet potatoes also contain antioxidants, fiber, and anti-inflammatory compounds that reduce oxidative stress and inflammation. Remember that sweet potatoes are just one part of a healthy diet. Eating a variety of fruits, vegetables, whole grains, lean proteins, and healthy fats, as well as maintaining a healthy lifestyle, is essential for overall immune health [66–68].

4.14. Blood Pressure Levels

Sweet potatoes can improve blood pressure levels due to their nutrient content and properties. They are a good source of potassium, fiber, and antioxidants that help regulate blood pressure, reduce inflammation, and support overall cardiovascular health. Sweet potatoes are also low in sodium and have a lower glycemic index, making them a heart-healthy food choice. However, they should be part of an overall balanced diet that includes a variety of healthy foods {237,238, 239,240,241].

4.15. Digestion

Sweetpotatoes are an excellent food for supporting healthy digestion. Here are some components available that are responsible for improving digestion [226–236]:

i. Fiber: Sweet potatoes are rich in dietary fiber, which adds bulk to the stool, promotes regular bowel movements, and fuels beneficial gut bacteria.
ii. Water content: Sweet potatoes have a high-water content, which can prevent dehydration and support proper digestion.
iii. Digestive enzymes: Sweet potatoes contain enzymes that can assist in the breakdown and digestion of carbohydrates, making them easier to digest and absorb.
iv. Anti-inflammatory properties: Sweet potatoes have anti-inflammatory properties due to the presence of antioxidants and other compounds, which may alleviate digestive inflammation and promote better digestion.
v. Vitamin B6: Sweet potatoes are a good source of vitamin B6, which supports the production of digestive enzymes necessary for efficient digestion. Remember, individual experiences with digestion may vary.

5. Industrial Application of Sweetpotato and Its Leaves

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Sweet potatoes have numerous industrial applications that go beyond their use as a food source [9,30,242–244]. Some of the potential industrial uses of sweetpotatoes include:

i. Starch Production: Sweet potatoes can be processed to extract starch, which has various industrial applications. Sweet potato starch can be used to produce biodegradable plastics, adhesives, paper, textiles, and pharmaceuticals.
ii. Ethanol Production: Sweet potatoes can serve as a feedstock for ethanol production. The starchy content of sweet potatoes can be fermented and converted into bioethanol, which can be used as a renewable fuel source or as an ingredient in the production of alcoholic beverages.
iii. Animal Feed: Sweet potato byproducts, such as peelings and leaves, can be used in animal feed production to provide a sustainable and cost-effective source of energy, fiber, and nutrients for livestock.
iv. Industrial Enzymes: Sweet potatoes contain enzymes that can be extracted and used in various industrial processes, such as brewing, baking, and waste treatment. These enzymes can improve process efficiency and reduce the use of harsh chemicals.
v. Bioplastics: Sweet potato starch can be used to produce biodegradable and environmentally friendly bioplastics that can replace traditional plastics derived from fossil fuels and contribute to reducing plastic waste pollution.
vi. Nutraceuticals: Sweet potatoes contain bioactive compounds that have potential health benefits. Extracts from sweet potatoes can be processed and used as ingredients in nutraceutical products, such as dietary supplements, functional foods, and natural additives.
vii. Industrial Colorants: Sweet potatoes' vibrant colors, particularly the purple-fleshed varieties, contain natural pigments that can be used as food colorants. These natural colorants can replace synthetic colorants and can be utilized in various food and beverage applications.
viii. Industrial Fibers: Sweet potato peelings and residues can be processed to obtain dietary fibers with functional properties. These fibers can produce low-calorie and high-fiber food products, such as breakfast cereals, baked goods, and snacks.
ix. Phytochemical Extracts: Sweet potato leaves contain many bioactive compounds that can be extracted and used to produce dietary supplements, functional foods, and pharmaceuticals. The phytochemical extracts from sweet potato leaves have shown potential health benefits, such as antioxidant and anti-inflammatory properties.
x. Natural Colorants: Sweet potato leaves can be used to extract a vibrant green color that can be used naturally in various food, beverage, and cosmetic products.
xi. Soil Revitalization: Sweet potato leaves have high amounts of organic matter and nutrients that can act as a natural fertilizer when incorporated into the soil. This helps improve soil health and productivity, making sweet potato leaves a valuable resource for sustainable agricultural practices.
xii. Cosmetic Ingredients: The bioactive compounds in sweet potato leaves have potential applications in the cosmetic industry. They can be used in skincare, haircare, and cosmetics as natural ingredients for their potential anti-aging, skin-soothing, and UV-protective properties.
xiii. Medicinal Uses: Sweet potato leaves have traditionally been used in some cultures for their medicinal properties. They are believed to have benefits for conditions such as diabetes, high blood pressure, and digestive disorders. Further research is needed to explore and validate their potential medicinal uses.

These potential industrial applications highlight the versatility and value of sweetpotato leaves beyond their culinary uses. Continued research and innovation in this field can unlock additional opportunities for using sweetpotatoes in multiple sectors, promoting sustainability and diversification of crop utilization (Figure 4).

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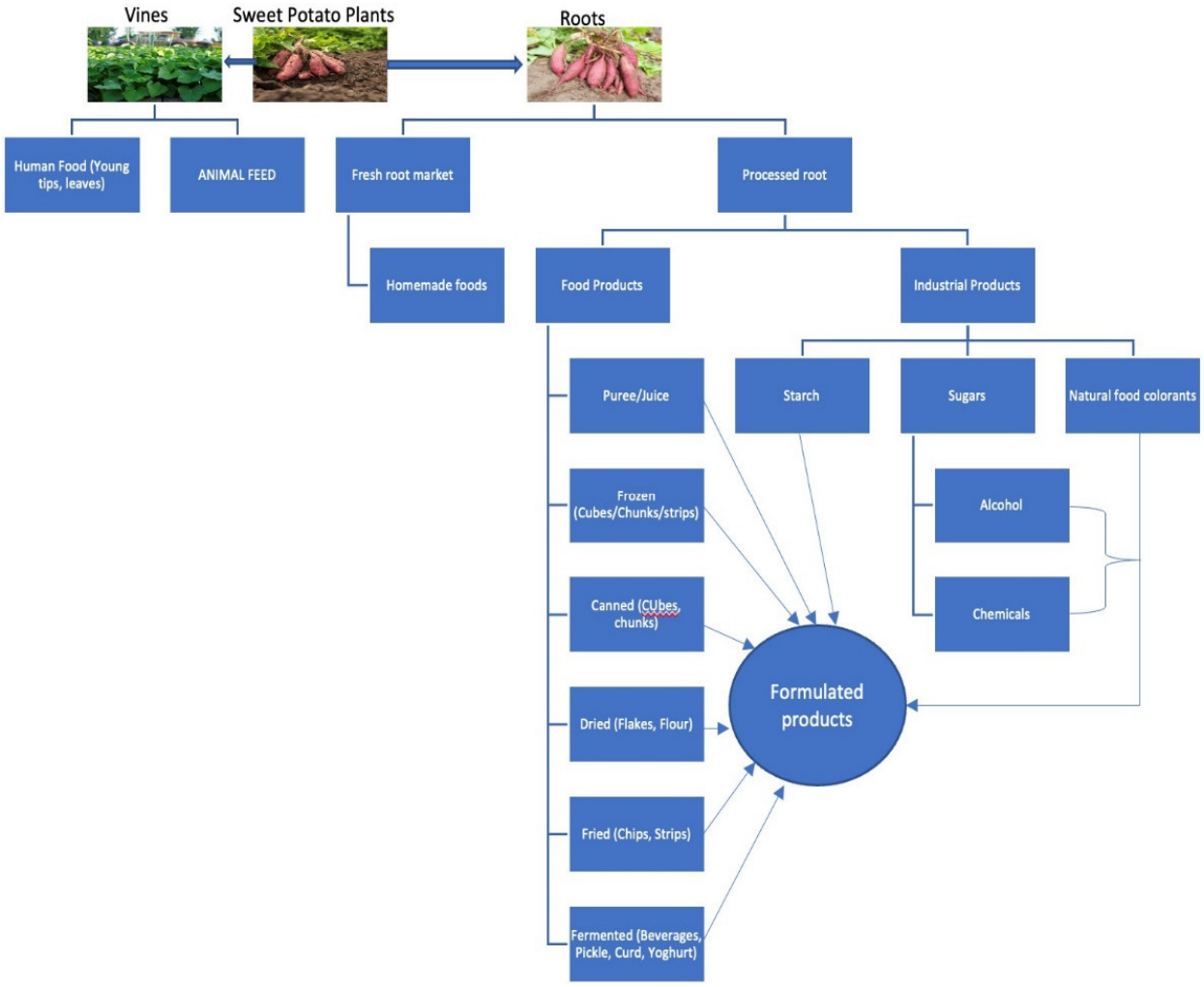

Figure 4. Utilization of Sweetpotato tubers and tops.

6. Foods from Sweetpotatoes Storage Roots

Sweetpotatoes, and their tops, are versatile and can be used to create various delicious and nutritious dishes [19,30,100,242–244]. Here are some popular sweet potato recipes: Baked Sweet potatoes- nutritious and flavorful; baked sweet potatoes can be enjoyed as is or topped with ingredients like butter, cinnamon, or honey. Sweetpotato fries- healthier than regular French fries, these crispy and delicious fries are made by cutting sweet potatoes into strips, tossing them with oil and seasoning, and baking or air frying until crispy. Mashed Sweetpotatoes- creamy and delightful, mashed sweet potatoes are like mashed potatoes. Boil or steam the sweet potatoes until soft, then mash them with butter, milk, and seasonings to taste. Sweetpotato Casserole- a popular holiday dish, sweetpotato casserole combines mashed sweet potatoes with a sweet and crunchy topping made of brown sugar, butter, and pecans or marshmallows. Sweetpotato Pancakes- add grated or mashed sweet potatoes to the pancake batter for a nutritious twist on pancakes. These pancakes are packed with fiber and vitamins and can be topped with maple syrup or your favorite toppings, Sweetpotato Soup- pureed sweet potatoes make a comforting and creamy soup. Combine cooked sweet potatoes with broth, seasonings, and other vegetables for a flavorful and nutritious dish. Sweet Potato Chips: For a healthier alternative to regular potato chips, thinly slice sweet potatoes, toss them with olive oil and spices, and bake until crispy, Sweetpotato Curry- adding sweet potatoes to a flavorful curry sauce can create a hearty and satisfying vegetarian or vegan meal. The sweetpotatoes add a natural sweetness to the dish. These are just a few examples, many others foods possible from sweetpotatoes (Figure. 5).

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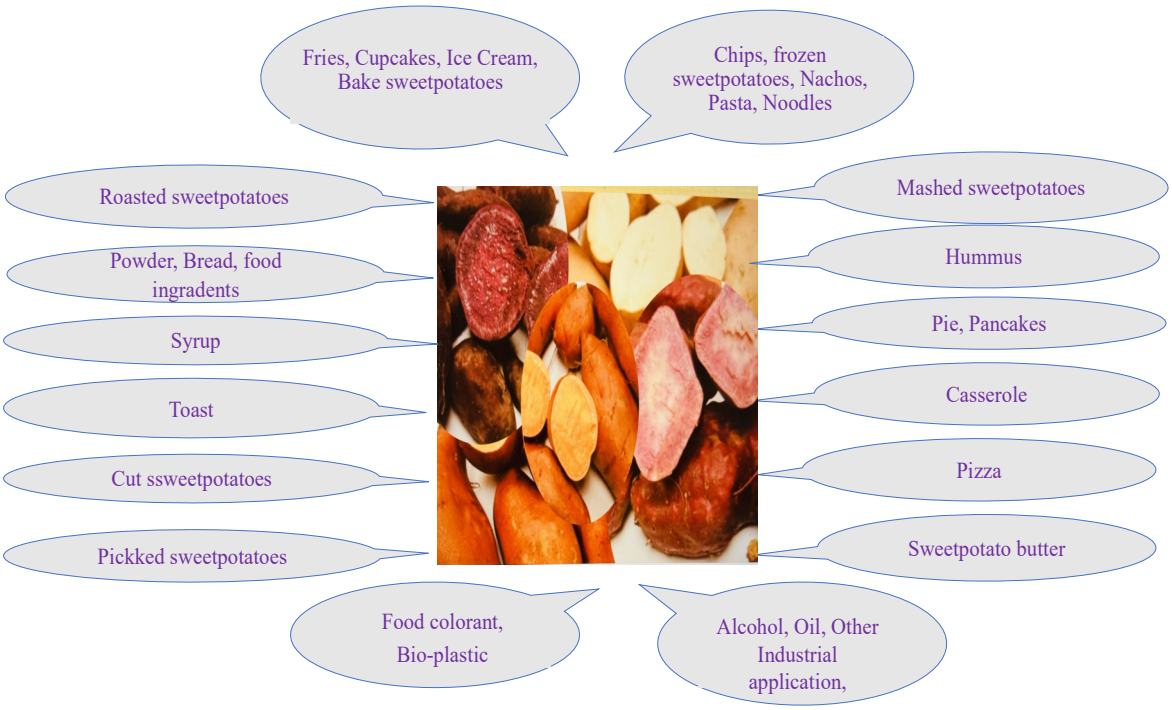

Figure 5. Different foods and other products from sweetpotato storage roots.

7. Foods from Sweetpotato Leaves

Incorporating sweet potato tops, also known as sweet potato greens, into your meals can be nutritious [19,30,31,100,242–244]. Here are some quick ideas: (i) Stir-Fried Sweetpotato tops- stir-fry with garlic and onions, (ii) Sauteed Sweetpotato tops- saute with olive oil, garlic, and herbs, (iii) Sweetpotato top salad- use as a base for a salad. (iv) Sweetpotato top smoothie- blend with fruits and liquids, (v) Sweetpotato top pesto- use it as a sauce for pasta, spread for sandwiches, or dip for vegetables., (vi) Sweetpotato top soup- combine with other vegetables to make a hearty soup. Many other foods are possible from sweetpotato top (Figure. 6).

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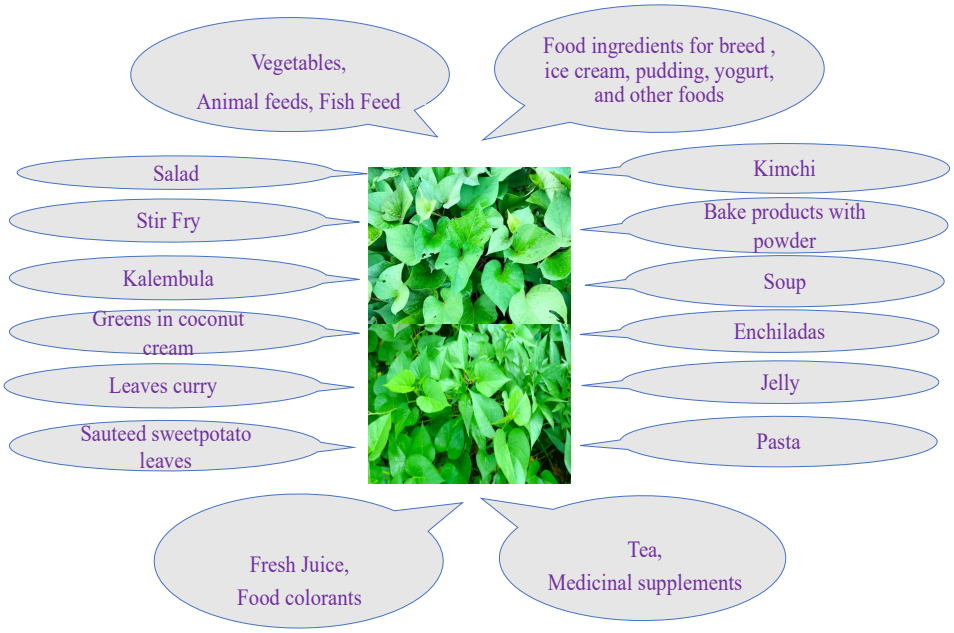

Figure 6. Different foods and other products from sweetpotato tops.

8. Use of Sweetpotatoes as Food Ingredients

Sweetpotatoes are a versatile and nutritious food ingredient that has recently gained popularity. These crops, i.e., tuber and leaves, are packed with essential vitamins, minerals, and dietary fiber, making them a healthy addition to any meal. They can be prepared in numerous ways, from baking and roasting to boiling and mashing. The natural sweetness of sweet potatoes adds a delightful flavor to dishes, whether used in savory recipes like soups and stews or in sweet treats like pies and puddings. Sweet potatoes are also a great gluten-free and vegan option, making them suitable for various dietary preferences. With their vibrant colors, delicious taste, and nutritional benefits, sweet potatoes have become a beloved food ingredient in traditional and innovative culinary creations. [19,30,31,100,242–244].

9. Sweetpotato Leaves as Ornamentals

Sweet potato leaves can be a beautiful addition to gardens, landscapes, and containers [225,226]. They come in various cultivars with colorful and variegated patterns, such as green, purple, burgundy, and pink combinations. The leaves have an attractive heart or palate shape and can be lobed or profoundly cut, depending on the cultivar. The textured foliage provides a visually appealing element to colorful ornamental displays. Sweet potato vines are known for their trailing and vining growth habit, which makes them ideal for hanging baskets, containers, or cascading elements in flower beds and borders. They are versatile, adaptable, and can be grown as standalone specimens or combined with other plants in mixed containers or landscape beds. Sweet potato plants are low-maintenance and easy to grow, requiring full sun to partial shade and well-drained soil. They need regular watering and occasional fertilization for optimal growth. Sweet potato plants provide seasonal interest throughout the growing season, starting with lush, vibrant foliage in spring and summer, which may change color in fall, adding to the autumn display. Additionally, some cultivars can produce edible tubers, making them a dual-purpose plant.

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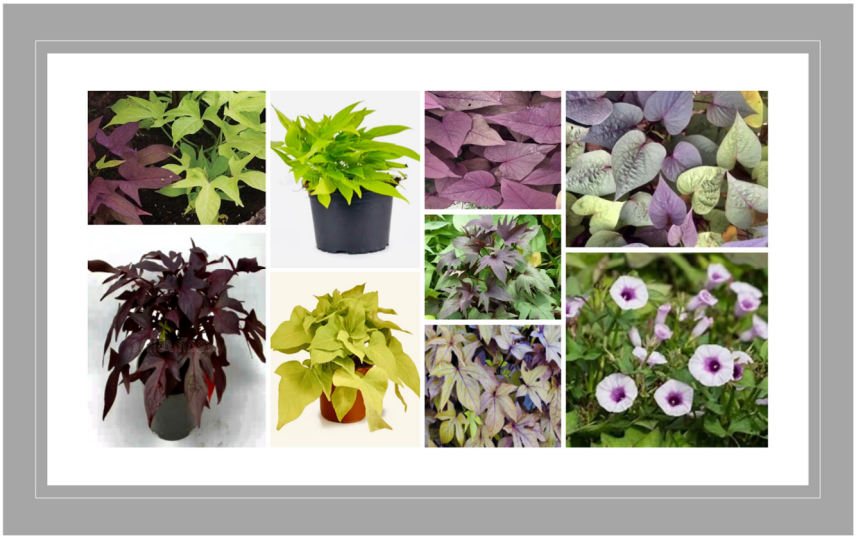

Picture 1. Sweetpotato leaves as ornamentals.

Sweetpotato leaves are colorful, textured, and versatile plants that can add beauty to gardens, landscapes, and containers. With their trailing and vining growth habit, they are ideal for hanging baskets, containers, or mixed with other plants. They are low-maintenance and easy to grow, providing seasonal interest throughout the growing season. Additionally, some cultivars can produce edible tubers.

10. Future of Sweetpotatoes for the Next Century and Recommendation for Future Research

Research on sweetpotato and its leaves has a lot of potential benefits and applications that can be explored further. Future studies can focus on various areas such as nutritional composition, health benefits, culinary and functional applications, food safety, sustainable farming practices, cultivar development, and industrial applications to understand the potential of sweet potato leaves and enhance their utilization in various fields. Scientists and researchers are interested in biotechnology research on sweet potatoes to improve the crop's quality and yield and develop resistance to pests and diseases. Biotechnology research can significantly improve sweet potato crops by enhancing nutritional content, resistance to pests and diseases, and increasing productivity. There are many diverse areas of biotechnology research related to sweet potatoes, and these are just a few examples. In the last decade, extensive research has been conducted on sweet potatoes, contributing to ongoing efforts to enhance sweet potato production, nutritional value, and overall sustainability in various regions worldwide. Here are some areas that are needed for future investigations:

a. Conduct a study on sweetpotato leaves' nutritional composition and bioactive compounds to identify their potential health benefits and culinary applications.
b. Explore sustainable farming practices for sweet potato production, including irrigation strategies, integrated pest management, and soil management techniques to optimize yield, quality, and sustainability.
c. Investigate the potential of sweet potatoes as a staple crop in regions with food security challenges to enhance food security and combat malnutrition.
d. Develop innovative sweet potato-based products to meet consumer demands for healthier and more diverse options, such as snacks, baked goods, beverages, and other processed food products.
e. Research the potential industrial applications of sweetpotato leaves, such as the production of phytochemical extracts, functional food ingredients, or natural colorants.
f. Conduct breeding programs and genetic studies to develop sweetpotato and its leaf varieties with enhanced nutritional profiles, disease resistance, and improved agronomic traits.

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g. Investigate the safety aspects of sweet potato leaves, including pesticide residues, microbial contamination, and post-harvest handling practices.
h. Develop guidelines and recommendations for proper cultivation, harvesting, processing, and storage to ensure the safety and quality of sweet potatoes and its leaves.
i. Utilize genetic engineering techniques to improve various traits of sweet potatoes, such as increasing resistance to diseases, pests, or environmental stressors.
j. Investigate the effects of climate change on sweet potato production and explore strategies to enhance its resilience, such as developing heat and drought-tolerant varieties.

The future of sweetpotatoes is bright, with endless potential in various fields. To explore their benefits and applications, it is essential to conduct extensive research on sweetpotatoes and their leaves. To achieve this, researchers must focus on various areas such as nutritional composition, health benefits, culinary and functional applications, food safety, sustainable farming practices, cultivar development, and industrial applications. Biotechnology research is also crucial in developing the crop's quality and yield, enhancing nutritional value, and increasing productivity. It is vital to prioritize research in these areas to ensure that sweet potato production remains sustainable and efficient for the coming century. Further analysis of the nutritional composition of sweet potatoes and their leaves is necessary to identify any potential health-promoting compounds in different varieties. It would be best to focus on developing sweet potatoes with enhanced dietary profiles through breeding programs, which can help identify specific nutrients, bioactive compounds, and potential health-promoting properties. More studies are needed to explore the specific health benefits of sweet potatoes, including their possible effects on cardiovascular health, cognitive function, gut health, and immune system support. Investigating the underlying mechanisms of these benefits can provide a better understanding of their impact on human health. Investigating sustainable farming practices, crop management techniques, and post-harvest storage methods is crucial to optimize the yield, quality, and sustainability of sweet potato production. This includes exploring irrigation strategies, integrated pest management, and soil management techniques. Genetic improvement efforts are directed toward developing sweet potato varieties with desirable traits such as high yield, disease resistance, improved flavor, and extended shelf life. This involves using advanced breeding techniques, molecular markers, and genetic engineering to accelerate breeding and introduce new traits into commercial varieties. In summary, there is a need for extensive research in the above areas to optimize their utilization across different fields. It is vital to prioritize research in these areas to ensure that sweet potato production remains sustainable and efficient for the coming century.

11. Conclusion

Sweet potatoes are a great addition to any meal. They are not only delicious but also offer various health benefits. Their high nutritional value, including vitamins, minerals, fiber, and antioxidants, makes them an essential part of a healthy diet. Incorporating sweet potatoes into our meals can help reduce the risk of chronic diseases, improve digestive health, regulate blood sugar levels, and enhance vision. With their versatility in the kitchen, sweet potatoes offer endless possibilities and can play a significant role in addressing future nutritional and environmental challenges. Therefore, we should embrace the power of sweet potatoes and enjoy their nutrient-rich goodness. Furthermore, sweet potatoes are a versatile and nutrient-rich vegetable that should be a part of every kitchen. They are a nutritional powerhouse, containing high amounts of vitamins, minerals, and antioxidants, and have a low glycemic index, making them great for promoting gut health. Their natural sweetness and ability to be incorporated into various dishes make them a favorite among consumers. Effective marketing strategies such as creating a solid brand identity, communicating their unique qualities and benefits, and utilizing social media platforms, participating in farmers' markets and local events, collaborating with chefs and food bloggers, and establishing partnerships with retailers can generate awareness and drive sales. By implementing these marketing strategies and tapping into the growing market of health-conscious consumers, growers and sellers of sweet potatoes can attract a loyal customer base. Moreover, sweet potato leaves, often neglected, are a nutritional powerhouse themselves. They are packed with essential vitamins, minerals, fiber, and antioxidants. Incorporating

sweet potato leaves into our diets supports heart health, digestion, and blood sugar regulation and provides anti-inflammatory benefits. With their versatility in the kitchen, sweet potato leaves can be used in various dishes, adding a delicious and nutritious touch. In addition, sweet potato leaves can be a sustainable crop, making them an attractive candidate for future agricultural practices. Therefore, we should recognize sweet potato leaves' nutritional benefits and explore their culinary possibilities to reap their full potential.

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