Volume 2024 Number 28 MICROGREENS WORLD Monday August 05, 2024

WEEKLY DIGEST

NEURODEGENERATIVE DISORDERS AND DEPRESSION: COULD MICROGREENS HOLD THE KEY?

ASTRONAUT FOOD: HOW DO YOU MAKE A MICROGREEN QUICHE IN SPACE?

CREATIVE RECIPES: Savory Microgreen and Goat Cheese Quiche with Beet Crust
COMMERCIAL BEST PRACTICES: Does Lighting Help Minimize Microgreens Growing Costs?
CULTIVATION TECHNIQUES: Can Far-Red Light Improve Plant Development?

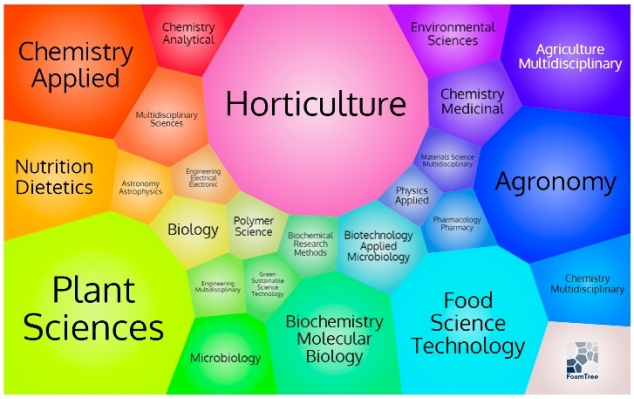
"Delivered to Your Inbox Every Monday," your summary digest of the latest microgreens, urban, vertical farming, and new trends and exciting startup stories from around the world.

Neurodegenerative Disorders and Depression: Could Microgreens Hold the Key?

Vol. 2024 No. 28 Monday, August 5, 2024

Nutrition Science

Research Trends and Development Patterns in Microgreens Publications: A Bibliometric Study from 2004 to 2023



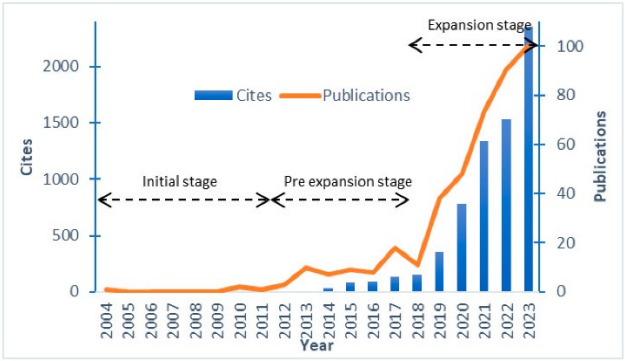
This bibliometric study analyzes research trends and development patterns in microgreens publications from 2004 to 2023 using data from the Web of Science database.

The analysis reveals that microgreens research has grown significantly since 2017, with the main research areas being **Food Science Technology**, **Horticulture**, and **Plant Sciences**.

The United States, Italy, and India emerged as the most influential countries in microgreens research. Key authors identified include Rouphael, Y., De Pascale, S., and Luo, Y.

The study highlights the most productive journals and funding sources in this field.

From 2018 onwards, a more noticeable upswing in citation frequency occurred, **exceeding 2300 citations** and almost 100 publications in the most recent year recorded.



Bibliometric tools were used to map relationships between authors, countries, and keywords, providing insights into research collaborations and trending topics.

The analysis shows that microgreens research is closely

linked to sustainable development goals, particularly zero hunger, climate action, and good health and well-being.

The study identifies current research focuses such as **nutritional quality**, **cultivation methods**, and **post-harvest considerations**.

It also points to **emerging areas like food safety** and the use of different lighting techniques in microgreens cultivation.

This comprehensive overview offers valuable insights for **researchers**, **policymakers**, and **industry professionals** interested in microgreens, highlighting research gaps and potential areas for future investigation in this rapidly growing field.

Research: *Puente, L., Char, C., Patel, D., Thilakarathna, M. S., & S, R. M. (2024). Research Trends and Development Patterns in Microgreens Publications: A Bibliometric Study from 2004 to 2023. Sustainability, 16(15), 6645.* https://www.mdpi.com/2071-1050/16/15/6645/

Astronaut Food: How do you make a microgreen quiche in space?

The collaboration between **Ohio State University** students and NASA to develop space-ready food systems, mainly focusing on microgreens, opens up exciting possibilities for both space exploration and small-scale agriculture on Earth.

By successfully growing and incorporating microgreens into space cuisine, like the quiche project, these "**simunauts**" are demonstrating the viability of cultivating nutrient-dense, fast-growing crops in confined environments.

For small microgreen growers, this research has significant implications (see *Deep Space Food Challenge*).

The technologies and techniques developed for space cultivation could be adapted for terrestrial use, potentially revolutionizing urban farming and enhancing production in challenging environments.

These advancements may lead to more efficient growing systems optimized for small spaces and resource conservation – critical factors for small-scale producers.

As space exploration drives innovation in sustainable food production, it could create new market opportunities for microgreens.

The increased visibility of these nutritious plants in space applications might boost consumer interest and demand on Earth.

Additionally, the waste-reduction and high-yield strategies employed in space could help small growers maximize efficiency and profitability.

Furthermore, the success of microgreens in space could inspire new applications in food deserts and urban areas, positioning small growers to play a crucial role in local food security and nutrition.

Source: *Gottsacker, E. (2024, August). How do you make a quiche in space? A team of college students just found out. The Statehouse News Bureau; STATE NEWS. https://www.statenews.org/section/the-ohio-newsroom/2024-08-01/how-do-you-make-a-quiche-in-space-a-team-of-college-students-just-found-out*

Research: *Boles, Haley O, et al. "Design, Build and Testing of Hardware to Safely Harvest Microgreens in Microgravity." Gravitational and Space Research, vol. 11, no. 1, 1 Jan. 2023, pp. 1–14, https://doi.org/10.2478/gsr-2023-0001.*

Creative Recipes

Savory Microgreen and Goat Cheese Quiche with a Beet Crust

This unique dish combines the earthy flavors of beets, the delicate taste of microgreens, and the tanginess of goat cheese

for a truly one-of-a-kind quiche experience.

The recipe is designed to be gluten-free, using almond flour in the crust, which also adds a nice nutty flavor.

The beet crust not only provides a beautiful color but also adds a subtle sweetness that complements the savory filling.

The microgreens are used in two ways: *lightly wilted in the filling to maintain their nutrients and flavor and fresh as a topping for added texture and visual appeal.*

This dual use of microgreens showcases their versatility and makes them the star ingredient.

Here's a brief overview of the components:

- **Beet Crust**: Instead of a traditional pastry crust, we'll use a mix of grated beets, almond flour, and eggs to create a colorful, gluten-free base.
- **Microgreen Filling**: Use a variety of microgreens like arugula, radish, and sunflower for different flavors and textures. The microgreens will be lightly wilted to maintain their nutrients and color.
- **Goat Cheese**: Creamy goat cheese will add tanginess and richness to balance the delicate microgreens.
- **Custard Base**: A light custard made with eggs, almond milk, and a touch of nutmeg will hold everything together.
- **Toppings**: Sprinkle raw microgreens on top after baking for added freshness and visual appeal.

This quiche is unique in several ways:

- The beet crust provides an unusual color and subtle earthiness.

- Microgreens are typically used as a garnish, but here, they're the star ingredient.
- The combination of textures (crisp crust, soft custard, tender microgreens) would be intriguing.
- It's a nutrient-dense dish that caters to health-conscious diners and those looking for gluten-free options.

From a taste and flavor perspective, selecting the best microgreens for this quiche involves considering both their individual flavors and how they complement the other ingredients.

For the best overall flavor profile, I would recommend using a mix of microgreens.

A combination I think would work particularly well is:

- 2 parts arugula microgreens
- 1 part radish microgreens
- 1 part sunflower microgreens

Arugula microgreens:

- Flavor profile: Peppery, slightly nutty
- Benefits: It adds a nice kick to contrast with the creamy goat cheese and earthy beet crust

Radish microgreens:

- Flavor profile: Spicy, crisp, with a subtle radish flavor
- Benefits: Provides a sharp contrast to the rich custard and cheese

Sunflower microgreens:

- Flavor profile: Nutty, slightly sweet
- Benefits: Offers a mild flavor that won't overpower the dish while adding texture

This mix would provide a balance of peppery, spicy, and nutty flavors that would complement the goat cheese and beet crust while still allowing the individual flavors of

the microgreens to shine through.

For the fresh topping, you could use a mix of more delicate microgreens like pea shoots or basil to add a final layer of flavor and visual appeal.

Remember that the intensity of flavor can vary depending on the growing conditions and age of the microgreens, so you might want to taste them before adding them to adjust the proportions based on their strength.

Savory Microgreen and Goat Cheese Quiche with Beet Crust

- Prep Time: 30 minutes
- Cook Time: 45 minutes
- Total Time: 1 hour 15 minutes
- Category: Main Dish
- Method: Baking
- Cuisine: Fusion
- Yield: 8 servings

Ingredients

For the Beet Crust:

- 2 medium beets, peeled and grated (about 2 cups)
- 1 1/2 cups almond flour
- 2 eggs
- 1/4 tsp salt
- 1 tbsp olive oil

For the Filling:

- 4 cups mixed microgreens (e.g., arugula, radish, sunflower)
- 8 oz goat cheese, crumbled
- 6 eggs
- 1 cup unsweetened almond milk
- 1/4 tsp nutmeg
- 1/2 tsp salt
- 1/4 tsp black pepper
- 1 tbsp olive oil

For Topping:

- 1 cup fresh microgreens

Instructions

1. Preheat the oven to 375°F (190°C).

2. Prepare the beet crust:

- In a large bowl, mix grated beets, almond flour, 2 eggs, 1/4 tsp salt, and 1 tbsp olive oil.
- Press the mixture into a 9-inch pie dish, creating an even layer on the bottom and sides.
- Bake for 15 minutes, then remove from oven and set aside.

3. Prepare the filling:

- In a large skillet, heat 1 tbsp olive oil over medium heat.
- Add 4 cups of microgreens and cook for about 2 minutes, just until slightly wilted. Remove from heat and let cool.

4. In a large bowl, whisk together 6 eggs, almond milk, nutmeg, 1/2 tsp salt, and black pepper.

5. Assemble the quiche:

- Spread the wilted microgreens over the pre-baked beet crust.
- Sprinkle crumbled goat cheese evenly over the microgreens.
- Pour the egg mixture over the cheese and microgreens.

6. Bake the quiche:

- Place the quiche in the preheated oven and bake

for 30-35 minutes, or until the center is set and the top is lightly golden.
- Remove from oven and let cool for 10 minutes.

7. Before serving, top the quiche with fresh microgreens.

Nutrition Information (per serving):

- Calories: 320
- Protein: 18g
- Carbohydrates: 12g
- Fat: 25g
- Fiber: 4g

Enjoy your unique and nutritious Savory Microgreen and Goat Cheese Quiche with Beet Crust!

Community News

OSU hosts 2024 Summer Undergraduate Research Expo

This recent **Oklahoma State University's** 2024 Summer Undergraduate Research Expo saw students from various majors present their research projects.

Morgan Mosby, a senior agriculture science major from Mississippi State University, participated in the Research and Extension Experiences for Undergraduates program at OSU.

Mosby's project evaluated the quality and yield of **red Russian kale microgreens** using different substrates, including biochar coconut core, hemp fiber, and commercial soil media.

The goal was to find renewable and sustainable substrates for growing microgreens.

Mosby spent the summer conducting her research and presented her findings at the

expo, engaging with attendees and discussing her results.

The experience not only provided her with research opportunities but also sparked her interest in potentially pursuing graduate studies at OSU.

Source: *Mindedahl, P. (2024, July 29). OSU hosts the 2024 Summer Undergraduate Research Expo. Oklahoma State University.* *https://news.okstate.edu/articles/communications/2024/osu_hosts_2024_summer_undergraduate_research_expo.html*

Growing so much: More and more urban farms sprouting in Lansing, Michigan

There seems to be a growing trend of **urban farming** in Lansing, Michigan.

Several local farmers share their experiences, highlighting the increasing interest in self-sustainability and **locally-grown** produce.

The trend is driven by factors such as rising grocery prices and a desire for fresh, organic food.

The article mentions various urban farming initiatives, including community gardens and programs that make it easier for residents to start growing food.

One notable example is the Hunter Park GardenHouse, which grows food for a local veggie box program and provides a community garden for residents.

Sarah Browne of Highwater Farms is highlighted as an urban farmer who sells at farmers' markets.

Faced with increasing competition as more urban farms emerge, Browne has diversified her crops.

She began growing **microgreens**, which have

allowed her to stand out in the market and enter retail spaces.

Microgreens are presented as a niche product that fewer people are selling, making it easier for farmers like Browne to differentiate themselves.

The article emphasizes the importance of farmers' markets in providing fresh, locally-grown produce to consumers, especially in areas where access to supermarkets may be limited.

These markets offer urban farmers a platform to sell their produce directly to local consumers, supporting both the farmers and the community's access to fresh food.

Source: *Editor. "Growing so Much: More and More Urban Farms Sprouting in Lansing - Brightgram." Brightgram, 24 July 2024, https://brightgram.com/lansing-mi/5310496/growing-so-much-more-and-more-urban-farms-sprouting-in-lansing/.*

What's Working: As food-insecurity funds end, Colorado farmers focus on food hub, ag incubator

Emerald Gardens, a microgreen farm co-owned by Roberto Meza and Dave Demerling, is playing a pivotal role in transforming food systems in Boulder, Colorado, particularly for underserved communities.

Delivering 6,000 containers of microgreens to the Aurora Public School District for their "Farm Fresh Fridays" program marked a significant milestone.

Unlike traditional greens, these microgreens offer higher nutritional value, flavor, and crunch, making them an appealing choice for school meals.

Initially reliant on the food service industry, the pandemic prompted the farm to shift toward social justice and food

equity initiatives, resulting in the establishment of the East Denver Food Hub to connect local farmers with underserved populations.

As federal funding decreases, Meza and Demerling aim to sustain their impact by balancing food justice initiatives with the economic viability of their operations.

Their focus extends towards creating an inclusive food ecosystem, supporting new farmers through the Ag and Food Lab, and fostering local procurement to address food insecurity sustainably.

Source: *Yamasaki, Parker, and Tamara Chuang. "What's Working: As Food-Insecurity Funds End, Colorado Farmers Focus on Food Hub, Ag Incubator." The Colorado Sun, The Colorado Sun, 3 Aug. 2024, https://coloradosun.com/2024/08/03/food-insecurity-colorado-farmer-food-denver/.*

Microgreens Marketing

The Featured Article

Neurodegenerative Disorders and Depression: Could Microgreens Hold the Key?

The **wellness community** is increasingly embracing **natural and alternative health solutions**.

As products like psilocybin chocolate gain popularity, you might be curious about other options for **mental health and cognitive function** support.

Microgreens are emerging as a promising choice for those seeking holistic approaches to mental well-being. These young, **nutrient-dense greens** pack a punch in supporting mental health and brain function.

Rich in antioxidants, vitamins, and minerals, microgreens offer a natural way to **boost your mood**, sharpen focus, and enhance overall brain health. Their **nutritional power** may help mitigate the effects of **neurodegenerative disorders** and depression.

By adding microgreens to your diet, you can tap into the benefits of vitamins C and E, beta-carotene, and polyphenols. Research shows these compounds can reduce stress, improve cognitive function, and promote **brain health**.

As you explore further, you'll discover various ways to incorporate microgreens as a natural boost for your mental well-being.

Microgreens – A Nutritional Powerhouse

You now have the opportunity to **boost your mental health** naturally.

Some of the most **nutrient-dense foods** on the planet, microgreens, are young, immature versions of leafy greens, herbs, fruit, flowers, and other vegetables that are harvested within 1-3 weeks of germination. They pack an incredible punch of vitamins, minerals, and antioxidants that support overall health and well-being.

As **nutritional powerhouses**, microgreens are rich in a wide array of essential vitamins, including calcium, iron, and phosphorus. They also include an array of phytonutrients, which greatly help support **brain health** through antioxidant effects.

This guarantees that incorporating microgreens as a daily part of our diet becomes a crucial adjunct for those who seek additional ways to naturally promote **whole-body wellness**.

Nutrients in Microgreens that Benefit Mental Health

As you investigate the **mental health benefits** of microgreens, you'll find that they're packed with nutrients that support your brain's well-being.

Vitamin C, vitamin E, beta-carotene, and polyphenols are just a few of the key players that can help reduce stress, improve your mood, and even **support cognitive function**.

Vitamin C: Known for reducing stress and improving mood

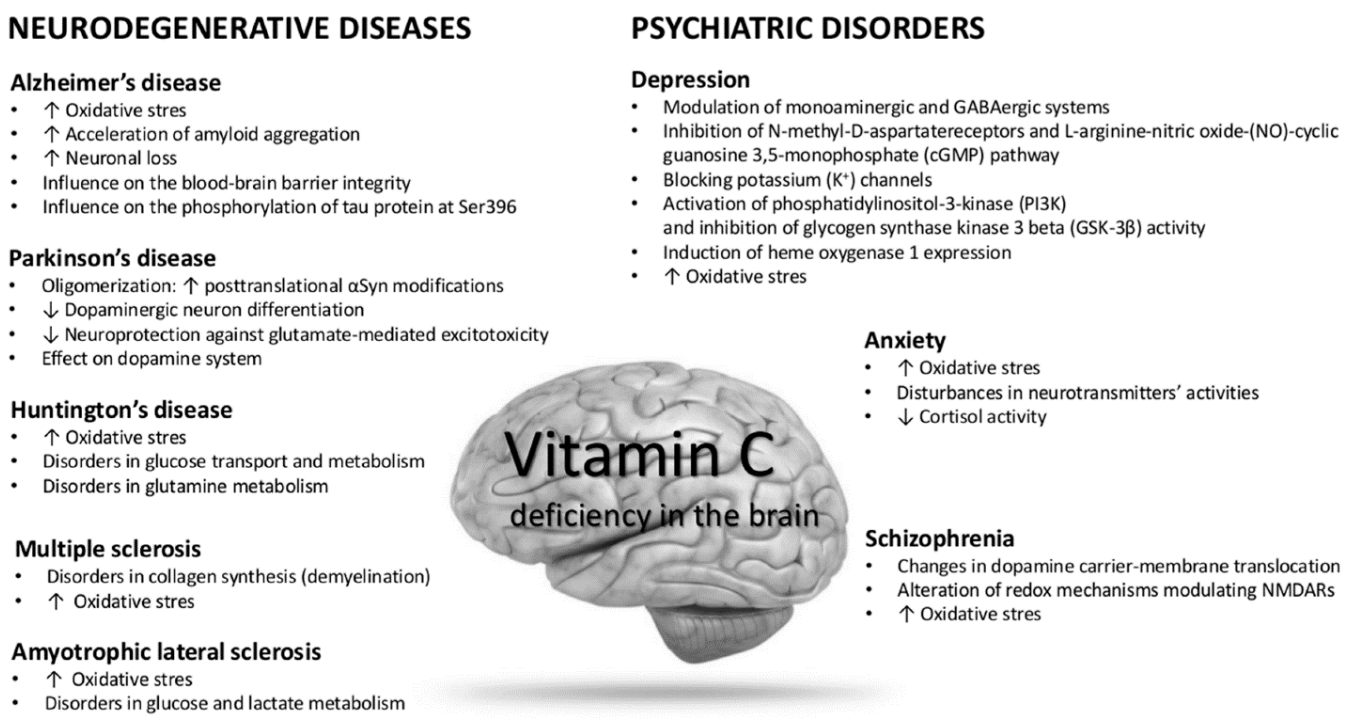
One essential nutrient found in microgreens that plays a significant role in supporting mental health is **vitamin C**.

Vitamin C has been shown to not only **reduce stress levels** but also **improve overall mood**.

You'll find vitamin C in microgreens like **radish**, which is one of the richest sources of this essential nutrient.

Consuming vitamin C-rich, microgreens can help boost your **mental wellness** by regulating stress hormones and promoting **cognitive function**.

This, in turn, can lead to improved mood and a reduced risk of depression.



By incorporating vitamin C-rich microgreens into your diet, you'll be taking a proactive step toward prioritizing your mental health and well-being.

Vitamin E: Acts as an antioxidant, protecting brain cells from oxidative stress

While **vitamin C** helps regulate stress hormones, another essential nutrient found in microgreens, **vitamin E**, takes on a different role in supporting mental health by acting as a **potent antioxidant** that shields brain cells from the damaging effects of **oxidative stress**.

You see, oxidative stress occurs when free radicals overwhelm your brain cells, leading to damage and even death.

Red cabbage microgreens are especially noted for their high vitamin E content. In general, microgreens from the **Brassicaceae family** (which includes broccoli, kale, and mustard greens) tend to have significant amounts of vitamins, including vitamin E.

Vitamin E steps in to neutralize these free radicals, protecting brain cells from harm. By doing so, it helps preserve **cognitive function** and reduce the risk of **neurodegenerative diseases**.

As you consume microgreens rich in vitamin E, you're giving your brain a powerful tool to fight off oxidative stress and maintain ideal health.

This is especially crucial for individuals at risk of or already living with neurodegenerative disorders.

Beta-carotene: Linked to improved cognitive function

Boosting your **brainpower** with **microgreens** is possible thanks to **beta-carotene**, an essential precursor to vitamin A, and a carotenoid pigment that research links to improved **cognitive function**, potentially shielding your brain from age-related decline.

You can find beta-carotene in microgreens such as **mung bean** and **cilantro**, which aren't only rich in this beneficial pigment but also contain other essential nutrients.

Beta-carotene helps protect your brain cells from damage, promoting healthy cognitive function and supporting overall **brain health**.

When you consume microgreens containing beta-carotene, you're giving your brain the necessary tools to stay sharp and focused, supporting your **mental well-being**.

So, if you're looking to give your brain a boost, try incorporating beta-carotene-rich microgreens into your diet – your brain (and body) will thank you!

A healthy brain means a healthier you, and that's a win-win.

Polyphenols: Anti-inflammatory properties that can support brain health

Rich in **antioxidants** and boasting impressive **anti-inflammatory properties**, **polyphenols** found in microgreens like green basil and purple basil can play a significant role in supporting your **brain health** and potentially reducing the risk of **neurodegenerative diseases**.

You've probably heard of antioxidants, but polyphenols are some of the most potent ones out there. They're not just limited to **basil**, either - many microgreens are packed with these beneficial compounds.

By incorporating polyphenol-rich microgreens into your diet, you're giving your brain a helping hand.

The anti-inflammatory properties of polyphenols can help mitigate oxidative stress, which is thought to contribute to neurodegenerative diseases like **Alzheimer's** and **Parkinson's**.

Scientific Evidence

As you investigate the scientific evidence behind **microgreens' mental health benefits**, you'll uncover that these young greens have higher nutrient densities than their mature vegetable counterparts.

We saw earlier that research (*Kocot et al., 2017*) has shown that **vitamins C and E**, in particular, play an essential role in reducing symptoms of depression and anxiety.

Microgreens have higher nutrient densities than mature vegetables.

When you harvest **microgreens** within 1-3 weeks of germination, you get a crop that's packed with a higher concentration of vitamins, minerals, and **antioxidants** compared to their mature counterparts.

This is because microgreens are harvested when they're still in their infancy, and their **nutrient-dense profile** makes them an excellent addition to a healthy diet.

Research *(Bhaswant et al., 2023)* has shown that microgreens contain higher levels of bioactive compounds, such as ascorbic acid, tocopherol, and carotenoids, which have been linked to numerous **health benefits**, including improved brain health.

By incorporating microgreens into your diet, you're giving your body a powerful boost that can help support **cognitive function**, memory, and mood.

Incorporating Microgreens into Your Diet for Mental Wellness

As you look to incorporate **microgreens** into your diet for mental wellness, you'll find it's easier than you think to make them a staple.

You can add a handful of microgreens to your morning smoothie for a **nutrient boost** or use them as a topping for salads, sandwiches, and soups for an extra dose of vitamins and antioxidants.

Adding microgreens to smoothies for a nutrient boost

You can instantly improve your smoothies with a **nutrient boost** by adding a handful of **microgreens**, which are packed with vitamins, minerals, and antioxidants that support **mental wellness**.

This simple addition can have a significant impact on **brain health** and **cognitive function**.

Microgreens are rich in flavonoids, which have been shown to have anti-inflammatory and antioxidant properties that can help protect against **neurodegenerative diseases**.

By incorporating microgreens into your smoothies, you can support the health of your brain and promote overall mental wellness.

So why not give it a try? Add some microgreens to your favorite smoothie recipe and reap the benefits of a nutrient-rich drink that's good for your mind and body.

With microgreens, you can take a proactive approach to supporting your mental health.

Using microgreens as a topping for salads, sandwiches, and soups

Sprinkle **microgreens** over your favorite salads, sandwiches, and soups to instantly improve their **nutritional value** and amplify your

meals with a boost of vitamins, minerals, and antioxidants that support mental wellness.

You'll be amazed at how easily you can incorporate these nutrient-dense greens into your daily diet.

Rich in antioxidants and polyphenols, microgreens have been shown to support **brain health** and **cognitive function**.

By adding them to your meals, you'll be giving your brain a helping hand. Plus, microgreens are a tasty and versatile addition to many dishes.

So go ahead, get creative, and start sprinkling those microgreens on your favorite foods. Your brain - and taste buds - will thank you!

This simple habit can have a profound impact on your **mental well-being**.

Creating microgreen pesto or other spreads

Beyond using **microgreens** as a topping, incorporating them into spreads like **pesto** is a great way to access their **nutritional benefits** and boost the flavor of your favorite dishes while supporting mental wellness.

When you blend microgreens into pesto, you're releasing their potent antioxidants and vitamins, which can help support **brain health**.

To make a microgreen pesto, simply combine your favorite microgreens with olive oil, garlic, lemon juice, and a pinch of salt in a food processor.

Blend until smooth, then spread on sandwiches, pasta, or veggies.

This tasty and nutritious spread can help support **mental clarity** and focus, making it a great addition to your daily meals.

Case Studies and Testimonials

Through real-life examples and personal accounts, we can gain a deeper understanding of how **microgreens** have positively impacted **mental health**, as seen in case studies and testimonials from individuals who've incorporated these nutrient-dense greens into their diets.

Microgreens and Mental Wellness: Sarah's Story

Take Sarah's story, for instance. After adding microgreens to her daily meals, she noticed **improved energy** and **mood stability**.

Her experience aligns with emerging research on nutrition and mental health, highlighting the potential of microgreens in supporting both physical and mental well-being.

Sarah is a 35-year-old graphic designer who has been struggling with mood swings and low energy for months. On her therapist's advice, she decided to make some dietary changes, including incorporating microgreens into her daily meals.

Here's her experience:

Week 1-2: Getting Started	"I started small, adding a handful of sunflower microgreens to my morning smoothie. I was skeptical at first, but I noticed I felt a bit more alert in the mornings."
Week 3-4: Expanding Varieties	"I branched out to broccoli and radish microgreens in my salads and sandwiches. By the end of the month, I realized I was having fewer 'afternoon slumps' at work."
Month 2: Noticeable Changes	"About six weeks in, I had a major deadline at work. Usually, this would trigger anxiety and sleepless nights. While I still felt stressed, I managed it better. I slept more soundly and had more stable energy throughout the day."
Month 3: Lifestyle Shift	"Three months in, and I'm hooked. I've even started growing my own microgreens! The ritual of caring for them has become a form of mindfulness practice for me. I feel more connected to what I eat, and my mood has definitely improved."

The Science Behind Sarah's Experience

While individual experiences vary, Sarah's story aligns with emerging research on nutrition and mental health:

1. Microgreens are rich in folate, which plays a crucial role in producing mood-regulating neurotransmitters.

2. The high antioxidant content in microgreens may help combat oxidative stress, which has been linked to depression and anxiety.
3. The act of growing and caring for plants, even tiny microgreens, can have therapeutic effects, reducing stress and promoting mindfulness.

Sarah's journey suggests that incorporating microgreens into one's diet as part of a balanced lifestyle may contribute to improved mental wellness.

While more research is needed, stories like Sarah's highlight the potential of these nutrient-dense greens in supporting both physical and mental health.

Conclusion: Microgreens and Cognitive Health

Now that we've examined the exciting research and benefits surrounding **microgreens**, you're empowered to harness the potential of these **nutrient-dense foods** to support your **mental wellness**.

By incorporating microgreens into your diet, you're taking a proactive approach to **brain health** and mental well-being.

Rich in antioxidants, **vitamins**, and minerals, microgreens can help mitigate the adverse effects of **oxidative stress**, inflammation, and neurodegenerative diseases.

As you investigate the world of microgreens, keep in mind that every bite counts and even small changes to your diet can have a profound impact on your mental health.

By choosing microgreens, you're choosing a natural, holistic approach to wellness that nourishes both body and mind.

Make the most of this opportunity and start cultivating a healthier, happier you today.

Research

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Evidence-based Expertise

Grow Your Microgreens Using This Portable, Chemical-Free Cultivator Made of Agri Waste

In the heart of Mumbai, India, food technologists Snehal Ambekar and Sayak Gupta have cultivated a solution to urban nutrition challenges: the "**Half Inch Garden**."

This innovative microgreens cultivator, born from Ambekar's personal health journey, addresses the hurdles of space constraints and plant care in city living.

The Half-Inch Garden is a compact, soilless device that utilizes hydroponic technology and biodegradable seed patches made from agricultural waste.

It offers a user-friendly approach to growing nutrient-dense microgreens at home, requiring minimal effort beyond adding water and waiting for harvest.

Microgreens, known for their high concentration of vitamins, minerals, and antioxidants, are often challenging to cultivate traditionally. Ambekar and Gupta's creation simplifies this process, making it accessible to anyone, regardless of gardening experience or living space.

Through their venture, SS AgriQulture Innovations, the duo aims to revolutionize how urbanites approach nutrition, encouraging reliance on fresh, home-grown superfoods rather than supplements.

As they prepare for production and market launch, the Half Inch Garden stands poised to transform urban nutrition, offering a sustainable, convenient path to better health through the power of microgreens.

They plan to launch the automated cultivator next month. Stay tuned!

Source: *Mani, S. (2024, August 2). Grow Your Microgreens Using This Portable, Chemical-Free Cultivator Made of Agri Waste. The Better India.* *https://thebetterindia.com/359436/grow-your-microgreens-using-this-portable-chemical-free-cultivator-made-of-banana-pulp-waste/*

Cultivation Techniques

Can Far-Red Light Improve Plant Development?

The study by *Hooks et al., 2022* investigated the effects of adding ultraviolet A (UVA) and far-red (FR) light to white LED lighting on the growth, morphology, and phytochemical content of indoor-grown microgreens.

The researchers found that adding **FR light increased plant height** in most species studied but reduced plant biomass in kohlrabi **and decreased concentrations of some phytochemicals** like total phenolics and antioxidants in certain species.

In contrast, adding UVA light had limited effects on the microgreens, only reducing plant height in basil.

The authors concluded that while FR light has more significant effects on microgreens than UVA under white LED lighting, **adding UVA and/or FR light may not be necessary** for indoor microgreen production due to potential adverse effects on yield and phytochemicals in some species.

Another study by *Yong et al., 2020* investigated the effects of various nighttime lighting treatments, including blue and far-red light, on the growth and

quality of mustard and arugula microgreens.

Far-red light, either alone or combined with blue light, showed the most s**ignificant promotion of plant height** compared to other treatments but had some negative impacts on plant quality metrics like leaf index and chlorophyll content.

The combination of blue and far-red light (20B20FR) further increased plant height compared to blue light alone, matching the elongation effect of far-red light while maintaining better quality characteristics.

The researchers concluded that while far-red light was most effective for elongation, using blue light alone or in combination with far-red light at night could promote sufficient microgreen **elongation for machine harvesting without compromising yield and quality**.

Research:

Hooks, T., Sun, L., Kong, Y., Masabni, J., & Niu, G. (2022). Adding UVA and Far-Red Light to White LED Affects Growth, Morphology, and Phytochemicals of Indoor-Grown

Microgreens. Sustainability, 14(14), 8552. https://doi.org/10.3390/su14148552

Ying, Q., Kong, Y., & Zheng, Y. (2020). Applying Blue Light Alone or in Combination with Far-red Light during Nighttime Increases Elongation without Compromising the Yield and Quality of Indoor-grown Microgreens. HortScience, 55(6), 876–881. https://doi.org/10.21273/hortsci14899-20

Emerging Industry News

Microgreens Market May Set New Growth Story | Fresh Origins, AeroFarms, Gotham Greens

The global microgreens market is set for significant expansion, projected to reach $6.13 billion by 2032 from $2.79 billion in 2023, growing at a CAGR of 11.9%.

This growth is driven by increasing demand for healthy foods, innovative farming methods, and broader adoption in culinary sectors.

Microgreens, young seedlings harvested after 7-21 days, offer dense nutritional benefits compared to mature plants.

Key market players like AeroFarms and Gotham Greens are focusing on strategic partnerships and technological innovations to expand their reach.

The market is influenced by the demand for organic foods and the rise of vertical farming and indoor gardening.

North America leads the global market and is expected to maintain its position due to growing consumer interest in health-oriented products.

The report covers market dynamics, product segmentation, farming methods, and regional analysis.

It highlights manufacturing costs, value chain factors, and investment opportunities across different regions.

This growth presents significant opportunities for small microgreen farmers.

You can tap into local markets, leveraging the trend towards urban gardening and culinary use of microgreens.

Advances in farming technology may help smaller producers enhance efficiency and competitiveness against larger companies.

Source: *Archive Market Research. (2024, August). Microgreens Market May Set New Growth Story| Fresh Origins, AeroFarms, Gotham Greens. OpenPR.com; openPR. https://www.openpr.com/news/3607575/microgreens-market-may-set-new-growth-story-fresh-origins*

Scientist Discovers PFAS-Eating Microbes That Could Clean Contaminated Drinking Water

As a small microgreens farmer, you might not think that bacteria munching on "forever chemicals" has much to do with your day-to-day operations.

But let me tell you, this discovery at UC Riverside could be a game-changer for folks like us.

You see, these Acetobacterium bacteria they've found can break down Per- and polyfluoroalkyl substances (PFAS), a group of man-made chemicals used in a variety of industries around the world since the 1940s.

These nasty chemicals stick around in our soil and water for ages.

Now, why should we care?

Well, clean water is the lifeblood of our farms, especially for delicate crops like microgreens.

Imagine a world where we don't have to worry so much about what's lurking in our irrigation water.

These tiny bacteria could be cleaning up contaminated groundwater before it even

reaches our wells. It's like having an invisible, tireless workforce purifying our water supply.

For us small microgreens farmers, this could mean lower costs in the long run.

We might not need to invest in expensive water filtration systems or deal with crop losses due to contaminated water.

It's a potential safeguard for our soil health, too, which we know is crucial for those nutrient-packed microgreens we're growing.

Now, it's early days yet. This isn't something we'll see rolled out tomorrow.

But it's a promising step towards cleaner, safer water for agriculture.

And in our line of work, where quality is everything, that's news worth celebrating.

So keep an eye on this development, fellow farmers. It might just be the future of how we ensure our water is as pure as the produce we're growing.

Source: *Food Safety Magazine Editorial Team. (2024, July 18). Scientists discover PFAS-eating microbes that could clean contaminated drinking water. Food Safety Magazine.* *https://www.food-safety.com/articles/9618-scientist-discovers-pfas-eating-microbes-that-could-clean-contaminated-drinking-water*

Commercial Best Practices

How Does Lighting Help Minimize Microgreens Growing Costs?

In their 2023 study, *Filatov and Olonin* investigated the optimal lighting conditions for growing microgreens in vertical farms, focusing on spectrum, light intensity, and photoperiod to minimize energy consumption and financial costs.

The researchers found **that increasing the proportion of red light** in the spectrum led to **higher yields and lower energy costs** for both cabbage and radish microgreens.

Additionally, a more extended photoperiod (16 hours) with lower light intensity (100 µmol·m-2·s-1) proved more energy and cost-efficient than shorter photoperiods with higher intensities.

For small microgreens farmers, these findings suggest that optimizing lighting parameters, particularly by using more red light and longer photoperiods with lower intensity, can significantly reduce production costs and improve profitability in vertical farming operations.

This study investigated the effects of different LED light spectra (blue, red, and a combination) on the growth and nutrient content of broccoli, mustard, and garden cress microgreens.

The researchers found that blue LED light generally led to higher levels of beneficial compounds like ascorbic acid, phenolics, and antioxidants compared to red or combined light.

LED lighting allows precise control over light spectra and intensity, enabling farmers to optimize growing conditions and potentially increase the nutritional value of microgreens.

For **small microgreens farmers**, these findings suggest that investing in blue LED lighting could be a cost-effective

way to produce higher-quality crops with enhanced nutritional profiles, potentially commanding premium prices and improving profitability.

The study demonstrates that dynamic lighting systems for vertical farms, controlled based on time-of-day electricity tariffs, can significantly reduce energy costs while improving crop yields.

Specifically, the experimental lighting system increased microgreen fresh weight by 18.5%. It reduced electricity costs per kilogram of microgreens by 55.4% compared to the control.

For small microgreens farmers, these findings imply that adopting intelligent, dynamic lighting systems could substantially lower production costs and increase yields, potentially making their operations more competitive with traditional farming methods despite the initially higher product costs (1.3-1.5 times the market average) associated with vertical farming.

Research:

Filatov, Dmitrii, and Igor Olonin. "Optimal Ratio of Spectrum, Light Intensity and Photoperiod to Minimize Costs When Growing Microgreens." E3S Web of Conferences, vol. 383, 1 Jan. 2023, pp. 04074–04074, https://doi.org/10.1051/e3sconf/202338304074.

Vrkić, R., Jana Šic Žlabur, Dujmović, M., & Benko, B. (2024). Can LED Lighting Be a Sustainable Solution for Producing Nutritionally Valuable Microgreens? Horticulturae, 10(3), 249–249. https://doi.org/10.3390/horticulturae10030249

FILATOV, D. A., & I.YU. OLONIN. (2024). ENERGY-EFFICIENT LIGHTING FOR GROWING MICROGREENS ON VERTICAL FARMS. Elektrotekhnologii I Elektrooborudovanie v APK, 71(2), 14–19. https://doi.org/10.22314/2658-4859-2024-71-2-14-19

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