

**MICROENCAPSULATED  
APPLE CIDER VINEGAR  
POWDER**

**WHITE PAPER**

**Botanical Innovations**





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# EXECUTIVE SUMMARY

## VINEGAR 5,000 YEARS OF HISTORY

Apple cider vinegar boasts an ancient lineage. Dating back 5,000 BC vinegar has been a staple part of the human diets for millennium. The first recorded use was by the Babylonians who used vinegar as a condiment and preservative. The Ancient Romans consumed vinegar as a beverage and the Ancient Greeks used vinegar to pickle meat and vegetables. The healing properties of vinegar have also been referenced in the bible and the work of Hippocrates. By 2,000BC vinegar production became commercialized and was used to treat disease and wounds.

Today vinegar is used taken orally and topically as a health supplement, in foods and beverages and as an ingredients in skin and hair care products.

Apple cider vinegar is derived from fermented apple cider. The fermentation process involves breaking down the sugar in apples by yeast and bacteria, transforming them into alcohol, which is subsequently converted to vinegar with acetic acid.

## BIO ACTIVE COMPOUNDS IN BOTANICAL INNOVAITONS APPLE CIDER VINEGAR POWDER

The main active component of Apple Cider Vinegar Powder is acetic acid, but it also contains other acids, vitamins, minerals, and enzymes.

## POTENTIAL HEALTH BENEFITS

- Asthma symptom alleviation
- Diabetes prevention and treatment
- Antioxidant
- Lowers glucose intake
- Prevention of Cardiovascular disease
- Lowers cholesterol
- Contains anti glycemc properties
- Weight loss



### **Digestion and Gut Health**

Apple Cider Vinegar Powder is believed to aid digestion by increasing stomach acid. Its prebiotic-like properties can also support the growth of beneficial gut bacteria.

### **Blood Sugar Regulation**

### **Weight Management**

Apple Cider Vinegar Powder may contribute to weight loss by promoting satiety, reducing calorie intake, and reducing visceral fat. Animal studies suggest that Apple Cider Vinegar Powder can reduce cholesterol levels, triglyceride levels, and blood pressure, potentially reducing heart disease risk.

### **Antimicrobial Properties**

Apple Cider Vinegar Powder has been shown to have antimicrobial properties, making it effective against certain pathogens.

### **Skin Health**

Anecdotal reports suggest that in topical applications Apple Cider Vinegar Powder may help with conditions like acne.

# APPLE CIDER VINEGAR PRODUCTION

*“An Apple a Day Keeps  
the Doctor Away.”*

*Benjamin Franklin*

The production of Botanical Innovations unique Apple Cider Vinegar Powder requires two major fermentation steps:

- Alcoholic Fermentation
- Acetic Acid Fermentation

## **Alcoholic Fermentation**

Botanical Innovations Apple Cider Vinegar is made from freshly crushed apple juice which contains all its natural sugars and fermentation agent yeast.

The yeast metabolise the natural fruit sugars in the apple juice (fructose and glucose) to produce ethanol and carbon dioxide.

## **Acetic Acid Fermentation**

Acetic acid production bacteria is added to the alcoholic apple juice which is exposed to aerobic conditions to create the apple cider vinegar with ‘mother’.

## **Difference between Raw and Filtered Apple Cider Vinegar**

There is a significant distinction between raw and filtered apple cider vinegar.

Botanical Innovations Apple Cider Vinegar Powder is made with Raw Apple Cider Vinegar. This is unfiltered, unpasteurized apple cider vinegar. It often contains the “mother” - a cloudy substance composed of proteins, enzymes, and beneficial bacteria.

Raw Apple Cider Vinegar tends to have a more robust flavor and retains more of its natural health benefits.

Filtered Apple Cider Vinegar is clear because it has been filtered and pasteurized to remove the mother and any sediment. The filtration and pasteurization processes reduce the enzyme and beneficial bacteria content. The production

The production of Botanical Innovations apple cider vinegar for microencapsulation combines ancient practices with modern knowledge. Its production is a delicate balance of quality raw materials, controlled environmental factors, and time-tested processes. The enduring popularity of Botanical Innovations Apple Cider Vinegar Powder can be attributed not just to its health benefits but also to the depth of flavour and versatility it brings to the culinary world.

## Vinegar Powder

### THE 'MOTHER IN APPLE CIDER VINEGAR

The term “mother” refers to a cobweb-like substance that can often be seen floating in bottles of raw and unpasteurized apple cider vinegar. This substance is known for its beneficial properties.

#### Composition and Structure

The “mother” is essentially a complex structure of beneficial bacteria involved in the creation and fermentation of the vinegar. It consists of:

- **Cellulose**

A natural fibre that forms the biofilm structure of the mother. It acts as a protective and supportive framework for the microbial inhabitants.

- **Acetobacter**

This is a genus of acetic acid bacteria responsible for converting alcohol into acetic acid, the primary component of vinegar. These bacteria thrive in the aerobic (oxygen-rich) conditions present during the vinegar fermentation process.

- **Proteins and Enzymes**

These play essential roles in the fermentation process and contribute to the overall nutritional content of Botanical Innovations Apple Cider Vinegar.

- **Yeast**

The mother can contain remnants of yeast from the initial alcoholic fermentation of apple cider, where yeast converts the sugars in apple juice to alcohol.

- **Formation and Role in Fermentation**

During the fermentation the acetobacter bacteria multiply and produce cellulose. Over time, as these cellulose layers accumulate, they form the gelatinous and viscous substance known as the mother. This biofilm floats due to the trapped carbon dioxide produced during fermentation. The mother acts as a reservoir of the acetobacter and yeast cells. When introduced into a new batch of apple cider, it accelerates the fermentation process, ensuring a consistent production of high-quality apple cider vinegar.

- **Health Benefits**

The presence of the mother is often seen as an indicator of the vinegar’s purity and health benefits. While apple cider vinegar in itself is believed to have numerous benefits, the mother is particularly valued for:

- **Probiotic Nature**

The bacteria and yeast in the mother can act as probiotics, promoting gut health by supporting a balanced intestinal flora.

- **Enzymes**

Botanical Innovations Apple Cider Vinegar Powder with the mother contains enzymes that can aid digestion.

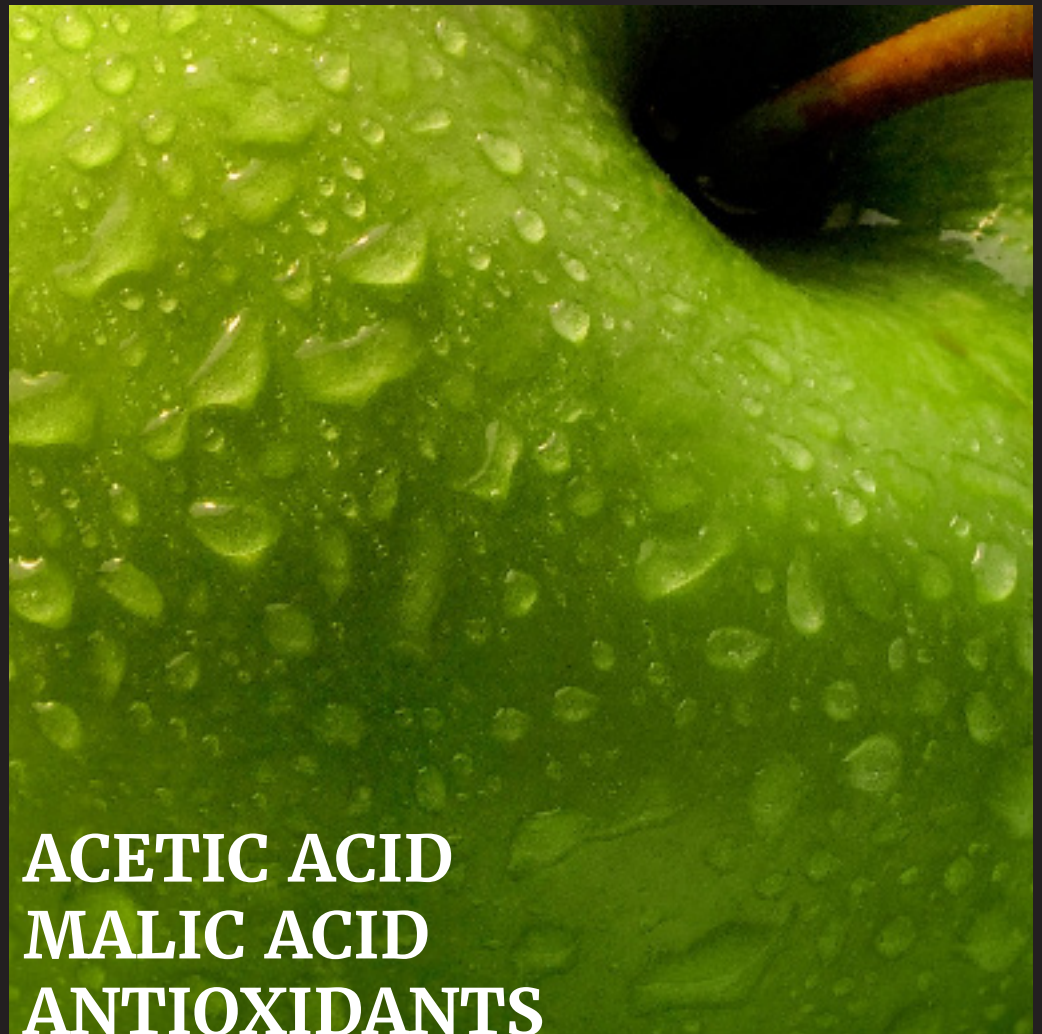
- **Nutrient Profile**

The mother in Botanical Innovations Apple Cider Vinegar Powder contributes to the mineral, vitamin, and amino acid content. The “mother” presence signifies a rich nutritional profile.

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# BIO ACTIVE

# COMPOUNDS



ACETIC ACID

MALIC ACID

ANTIOXIDANTS

PECTIN

VITAMINS & MINERALS

# BIOACTIVE COMPOUNDS IN BOTANICAL INNOVATIONS APPLE CIDER VINEGAR POWDER

Botanical Innovations Apple Cider Vinegar Powder is a versatile ingredient for health and wellness applications. The benefits are attributed to its active compounds, which result from the fermentation process of apple juice.

## **Acetic Acid**

Acetic acid is the primary active compound in apple cider vinegar and gives the vinegar its characteristic tart taste and pungent smell.

During the fermentation process, the ethanol (alcohol) produced from the apple sugars is converted into acetic acid by acetic acid bacteria (*Acetobacter* species).

Acetic acid is believed to have several health benefits:

- **Blood Sugar Regulation** Some studies suggest that acetic acid can improve insulin sensitivity and reduce blood sugar spikes after meals.
- **Weight Management** It may increase feelings of fullness, thereby reducing calorie intake.
- **Antimicrobial Properties** Acetic acid has been shown to possess antimicrobial activity against certain bacteria, fungi, and other pathogens.

## **Malic Acid**

Another significant acid found in Botanical Innovations Apple Cider Vinegar Powder malic acid contributes to the sour taste of the vinegar.

Naturally present in apples, it remains in the vinegar after fermentation.

Malic acid is associated with improved energy production in the body and is also an essential component of many skin care products due to its exfoliating properties.

## **Amino Acids**

Amino acids are the building blocks of proteins.

Present in small amounts, these are derived from the apple content and the microbial activity during fermentation.

Amino acids are essential for numerous physiological functions, including protein synthesis, neurotransmitter production, and energy metabolism.

## **Antioxidants**

Botanical Innovations Apple Cider Vinegar Powder contains various antioxidants, which are compounds that counteract the damaging effects of free radicals in the body.

These antioxidants originate from the apple content. Key antioxidants in Botanical Innovations Apple Cider Vinegar Powder include catechin, epicatechin, and chlorogenic acid.

Antioxidants are believed to support cellular health and counteract the aging process and the development of certain diseases.

## **Pectin**

Pectin is a type of soluble fiber found in apples. Though some pectin is broken down during fermentation, Botanical Innovations Apple Cider Vinegar Powder still retains a portion of it.

Pectin can promote gut health by providing a source of sustenance for beneficial bacteria. It's also known to help regulate cholesterol levels in the bloodstream.

## **Vitamins and Minerals**

Botanical Innovations Apple Cider Vinegar Powder contains small amounts of minerals such as potassium, calcium, and magnesium. Vitamins, like vitamin C and B-vitamins, are also present, but in relatively lower quantities.

# APPLE CIDER VINEGAR POWDER FOR DIGESTIVE HEALTH

Apple cider vinegar has been celebrated for its potential health benefits for centuries. Among these proposed benefits, its impact on digestive and gut health stands out as one of the most frequently discussed. This analysis delves deep into the current scientific understanding of how Botanical Innovations Apple Cider Vinegar Powder might contribute to improved digestive health.

## **Acidic Nature and Stomach pH**

Botanical Innovations Apple Cider Vinegar Powder is acidic due to its main component, acetic acid. Consuming a small amount of Botanical Innovations Apple Cider Vinegar Powder before meals may increase the acidity in the stomach, which can aid in the digestion of certain foods. A more acidic environment may facilitate the stomach's digestion of proteins by optimizing pepsin's activity, the primary digestive enzyme responsible for protein breakdown.

## **Prebiotic Effect**

Botanical Innovations Apple Cider Vinegar Powder contains pectin and other prebiotic fibers that resist digestion in the upper gastrointestinal tract. These fibres can serve as food for beneficial gut bacteria in the colon, promoting their growth and leading to a more balanced and diverse gut microbiota.

## **Probiotic Presence**

The 'mother' in Botanical Innovations Apple Cider Vinegar Powder is a source of beneficial bacteria and yeast. The presence of beneficial microbes can potentially contribute to a healthier gut microbiome, enhancing digestive health and boosting immunity.

## **Antimicrobial Action**

The acetic acid component, displays antimicrobial properties and consumption may help control pathogenic bacteria in the gut, reducing the risk of infections.

## **Improved Mineral Absorption**

The acetic acid in Botanical Innovations Apple Cider Vinegar powder may enhance the body's ability to absorb essential minerals from the consumed food. Consuming Botanical Innovations Apple Cider Vinegar Powder may assist in the absorption of minerals like calcium and magnesium from the digestive tract, supporting bone health and muscular functions.



# APPLE CIDER VINEGAR POWDER AND WEIGHT MANAGEMENT



Various studies have explored the mechanisms by which apple cider vinegar might influence weight-related factors. Let's dive into a comprehensive analysis of its potential benefits for weight management.

## **Appetite Suppression**

Apple Cider Vinegar has been observed to impact satiety and hunger cues. Consumption of Apple Cider Vinegar Powder may promote feelings of fullness, which can lead to reduced calorie intake. The acetic acid may cause a delay in gastric emptying, resulting in a prolonged feeling of fullness after meals. Reduced food intake can naturally contribute to weight loss over time.

## **Improved Metabolic Rate**

Metabolism dictates how efficiently the body utilizes the energy from food. Preliminary studies in animals suggest that the acetic acid in apple cider vinegar may enhance the metabolism, thereby increasing the rate at which the body burns calories. A faster metabolism can support weight management efforts by increasing daily caloric expenditure.

## **Fat Storage Reduction**

Apple Cider Vinegar Powder may play a role in the physiological processes that dictate fat storage. Research on animals indicates that acetic acid can upregulate genes responsible for fat burning and reduce those that promote fat storage. This can lead to decreased belly fat and liver fat accumulation. However, the translation of these effects to humans requires more substantial evidence.

Apple cider vinegar, when used as a part of a holistic approach to health, can potentially offer benefits for weight management.

## **BENEFITS OF BOTANICAL INNOVATIONS MICROENCAPSULATED APPLE CIDER VINEGAR POWDER WITH 'MOTHER'**



Microencapsulation is a technology where tiny droplets or particles of a substance (in this case, apple cider vinegar surrounded and coated with maltodextrin a corn based starch. This shell material protects the apple cider vinegar.

The benefits of Botanical Innovations Microencapsulated Apple Cider Vinegar over traditional liquid include:

- Improved Stability
- Controlled Release
- Enhanced Bioavailability
- Odour and Taste Masking
- Gastrointestinal Protection
- Versatility in Formulation
- Improved Transport and Storage

Botanical Innovations Microencapsulated apple cider vinegar offers several advantages that address the limitations and challenges associated with traditional apple cider vinegar By enhancing stability, bioavailability, and user experience while also providing protection to the gastrointestinal tract. Botanical Innovations Microencapsulated Apple Cider Vinegar Powder holds promise for those seeking to harness the benefits of apple cider vinegar in a more refined and versatile form.

### **Improved Stability**

Apple cider vinegar contains bioactive compounds that can be sensitive to factors like oxygen, light, and temperature. Microencapsulation shields these compounds.

Botanical Innovations Apple Cider Vinegar Powder has a longer shelf life and retains its beneficial properties for an extended period, reducing the rate of degradation of the active ingredients.

### **Controlled Release**

Microencapsulation can allow for a controlled or targeted release of Apple Cider Vinegar constituents.

The controlled release ensures that the beneficial components of Apple Cider Vinegar are made available gradually, offering prolonged benefits.

#### **Enhanced Bioavailability**

Microencapsulation can be designed to enhance the solubility and absorption of bioactive compounds in the digestive tract.

Enhanced bioavailability means that a higher percentage of the beneficial components are absorbed into the bloodstream, optimizing the potential health benefits.

### **Odour and Taste Masking**

One common complaint about apple cider vinegar is its strong smell and taste, which some find unpalatable. Microencapsulated Apple Cider Vinegar Powder products, especially in pill or powder form, can mask the pungent taste and odour, making it more appealing to a wider range of consumers.

### **Gastrointestinal Protection**

Apple Cider Vinegar acidity can irritate the stomach lining or harm tooth enamel when consumed undiluted. Microencapsulated Apple Cider Vinegar Powder products can release acidic acid in the stomach where it's meant to act, reducing the direct contact of the acid with teeth and the upper gastrointestinal tract. This can reduce the risk of enamel erosion and stomach discomfort.

### **Formulation Versatility**

Microencapsulation enables Apple Cider Vinegar incorporation into a variety of products.

Botanical Innovations Microencapsulated Apple Cider Vinegar Powder can be integrated into gummies, pills, sachets, functional foods, beverages, and even cosmetics, expanding its application range.

### **Improved Storage and Transportation**

Liquid Apple Cider Vinegar requires specific storage conditions to retain its properties and can be cumbersome to transport.

Microencapsulated forms are lighter, occupy less space, and are less prone to spillage or breakage, making storage and transportation more efficient.

# Nutraceutical Applications

## **Enhanced Stability and Shelf Life**

**Case Study:** Nutraceutical soft gels containing Botanical Innovations Microencapsulated Apple Cider Vinegar Powder can maintain their efficacy for longer durations compared to those with traditional apple cider vinegar reducing waste and ensuring consistent dosage for the consumer.

## **Precision in Targeted Release**

**Case Study:** Delayed-release capsules can be designed to release Botanical Innovations Microencapsulated Apple Cider Vinegar Powder in the intestines rather than the stomach, optimizing benefits for gut health without causing stomach irritation.

## **Taste and Odour Masking**

### **Case Study**

Nutraceutical snack bars fortified with Botanical Innovations Microencapsulated Apple Cider Vinegar Powder can offer the benefits of apple cider vinegar without altering the product's desired taste profile.

## **Versatility in Product Formulation**

**Case Study:** Botanical Innovations Microencapsulated Apple Cider Vinegar Powder can be integrated into pills, functional gummies, protein powders and sachets making it more accessible to different consumer demographics.

## **Enhanced Bioavailability**

**Case Study:** Soft gels containing Botanical Innovations Microencapsulated Apple Cider Vinegar Powder designed for improved solubility can ensure that a higher percentage of apple cider vinegar's beneficial compounds, like acetic acid, are absorbed, optimising its metabolic and digestive benefits.

## **Improved User Compliance**

**Case Study:** A daily wellness sachet containing Botanical Innovations Microencapsulated Apple Cider Vinegar Powder, combined with other Botanical Innovations beneficial ingredients like turmeric or ginger extract or oils powders, can be a palatable and convenient way for users to integrate apple cider vinegar powder into their daily routine. Botanical Innovations Microencapsulated apple cider vinegar powder offers a promising frontier for the nutraceutical industry. By addressing issues of stability, taste, and bioavailability, microencapsulation allows for innovative product formulations that can cater to a broader range of consumers.



# FUNCTIONAL FOOD AND BEVERAGE APPLICATIONS

Apple cider vinegar is a well-known food ingredient, touted for its numerous health benefits. However, its direct application in food and beverage products often faces challenges due to its strong flavour, acidity, and potential stability issues. Botanical Innovations Microencapsulated Apple Cider Vinegar Powder provides a viable solution.

## Benefits of Botanical Innovations Microencapsulated Apple Cider Vinegar Powder

- Flavour Masking and Taste Optimisation
- Improved Shelf Stability
- Broad Product Applications
- Versatility in Beverage Formulation
- Enhanced Consumer Appeal
- Consistent Product Quality

The incorporation of microencapsulated apple cider vinegar presents significant opportunities for food and beverage manufacturers. It allows them to innovate, expand product lines, and cater to the growing health-conscious consumer segment. By tackling the challenges associated with direct apple cider vinegar Botanical Innovations Microencapsulated Apple Cider Vinegar Powder ensures consistent quality, broadened applications, and enhanced consumer appeal. As the food and beverage industry continues to evolve, leveraging such advancements can be pivotal in staying ahead in the market.



# BEAUTY APPLICATIONS

Apple cider vinegar has been celebrated for its potential benefits for skin and hair health, often touted for its antimicrobial properties, balancing pH, and promoting clarity. Yet, its pungent aroma and potential for irritation in undiluted forms present challenges in beauty product formulations.

## **Enhanced Product Stability and Shelf Life**

Botanical Innovations Microencapsulated Apple Cider Vinegar Powder active ingredients from oxidation and degradation, increasing the shelf life of beauty products and ensuring consistent efficacy over time.

## **Controlled Release for Prolong Benefits**

Microencapsulation allows for a time-released or targeted delivery of APPLE CIDER VINEGAR POWDER's benefits, providing prolonged efficacy on the skin or hair.

## **Mitigation of Irritation Potential**

Direct application of apple cider vinegar can sometimes lead to skin or scalp irritation. Botanical Innovations Microencapsulated Apple Cider Vinegar can ensure a controlled release, reducing the risk of immediate irritation.

## **Odour Masking for Improved Sensory Experience**

One of the significant barriers to using apple cider vinegar in beauty products is its strong odour. Botanical Innovations Microencapsulated Apple Cider Vinegar in formulation can help mask this, improving the overall sensory experience for users.

## **Enhanced Formulation Flexibility**

Botanical Innovations Microencapsulated Apple Cider Vinegar Powder allows formulators to integrate apple cider vinegar into a wider variety of beauty products without concerns about texture, pH imbalances, or ingredient interactions.

## **Targeted Treatment Options**

With Botanical Innovations microencapsulated Apple Cider Vinegar Powder, beauty brands can create products that target specific skin or hair concerns, harnessing the specific benefits of apple cider vinegar in a controlled manner.

Microencapsulated apple cider vinegar offers revolutionary possibilities for the beauty industry. From enhanced stability to improved user experience, the advantages are clear. Brands that harness this technology can provide effective, appealing products that deliver apple cider vinegar celebrated benefits in innovative ways. As consumer demand for natural yet effective beauty solutions grows, products containing Botanical Innovations Microencapsulated Apple Cider Vinegar Powder are poised to gain prominence in the market.



**Botanical Innovations  
Microencapsulated Nutraceutical Flavours, Fragrances  
and Ingredients for Health and Wellness Applications.**

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