

## VITAMIN C: A VERSATILE INTEGRANT FOR COMMERCIAL USAGE

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### ABSTRACT

L-Ascorbic acid is a versatile integrant that is found in abundance in nature and can be easily isolated. It has numerous applications due to its salubrious virtue and commercially effectual usage. The review is a concise narrative to its commercial viability.

### 1. INTRODUCTION

L-Ascorbic acid is commonly known as Vitamin C. It is found only in citrus fruits, vegetables like cabbage family, cantaloupe, strawberries, peppers, tomatoes, potatoes, lettuce, papayas, mangoes, kiwi fruit. It is an abundant, multi-functional component that works as an essential nutrient for the growth and development of plants and animals. It is found to be stable in its dry condition but unstable to air, heat and light. It is a naturally occurring, water soluble, vital reducing and antioxidant agent that offers numerous bio-medical, commercial and nutraceutical advantages.

It is also a free radical scavenger that protect our tissues, cell membranes and DNA from oxidative damage. It is important for immune system health and aids in iron absorption. The role of vitamin C in providing better esthetics exhibits great importance. Due to its protective role, the supplementation of vitamin C serves as a prerequisite to sustain life on significant rise in pollution. It is vital in improving the immunity by fighting infections and detoxifying reactions. Its deficiency causes

scurvy and capillary fragility, which results in weakness of the tissues and collagens. [1-6]

### 2. Viability for Commercial Applications

#### 2.1 Efficacy as serum for dermal care and anti aging product

Personal care products are essential and frequently used items that need to be selected judiciously. Personal care formulations include ascorbic acid derivatives such as magnesium ascorbate, calcium ascorbate, magnesium ascorbyl phosphate, sodium ascorbate and sodium ascorbyl phosphate that act as antioxidants to slow down the deterioration of the finished product on exposure to the air and pH change of the product Vitamin C plays a vital role in photo protection, wrinkling and wound healing so it is preferred in skin care lotions, creams and cosmetics. UV light depletes vitamin C content of the skin. Ascorbic acid reduces hyper pigmentation, UV-related DNA damage and lipid peroxidation that limits the release of pro-inflammatory cytokines and protects against apoptosis. The oxidative protein damage is

a distinguishing feature of both photo damage and intrinsic aging. This oxidative damage leads to change in skin structure. Ascorbic acid regulates the synthesis of the structural protein collagen and hydroxylation of collagen molecules. Hydroxylation of collagen supports extracellular stability and the epidermis. It has shown to stabilize collagen mRNA for collagen protein synthesis of the damaged skin. Ascorbic acid increases the proliferation rate of fibroblasts that gets decreased with increase in age. Ascorbic acid promotes wound healing by stimulating the formation of the epidermal barrier. It increases collagen synthesis and decrease the inflammatory responses of the wound and increases wound closure time in healthy person.[1-6]

## 2.2 Valuable in agriculture

Ascorbic acid serves as a major redox buffer and regulates various physiological processes controlling growth, development and stress tolerance. It helps to deal with stresses from drought to ozone and UV radiation. Vitamin C provides protection against the harmful side-effects of light during photosynthesis, the process by which light energy is used to convert carbon dioxide into plant matter. ascorbic acid alone increased number of leaves and leaf area, It modulate oxidative stress in plants by controlling detoxification. Any fluctuations, increases or decreases even at cellular levels can have profound effects on plant growth and development, as it is associated with the regulation of the cell cycle, redox signaling, enzyme function and defense gene expression. L-Ascorbic acid is directly or indirectly involved in the metabolic processes and physiological functions of plants. [7]

## 2.3 Utility in confectionery

Ascorbic acid is widely used as an additive. It is the most common choice keeping in

consideration the public health, cost effectiveness, stability of the vitamin in the food during shelf life and home preparation. It is subjected directly to the flour by the miller or dough. It is supplemented in the bread due to its properties that helps to extend the shelf life. When it is undergoes baking process, ascorbic acid enhances a number of desired features such as strengthened gluten, greater loaf volume, finer crumb, tenderness to the crumb, reduction of crust thickness, faster rising loaf for quicker baking and reduction in the number of damaged loaves while transportation. Utilization of ascorbic acid in an industrial bakery contributes to higher profit yields, lower production time and better consumer satisfaction. [8,9]

## 2.4 Advantage in water treatment

Water treatment plants use chlorine disinfectant to remove bacteria. Chlorine is an effective neutralizer of bacteria that makes water safe for drinking and other purposes. The chlorine solution that is discharged after water treatment is harmful and disturbs the aquatic life. The chlorinated water is stored in an open container for the air and sunlight to naturally dissipate the chlorine over the time. The method is time Consuming and tedious for large scale operation.

Ascorbic acid serves as a useful means to neutralize chlorine than other sulfur based chemical methods. Using ascorbic acid in combination with sodium ascorbate makes chlorinated water safe for utilization and harmless for the environment.[10,11]

## 2.5 Effectual in meat industry

Preservation of meat is an important aspect for its marketing, selling and consumption. Ascorbic acid primary function in meat environment is to prevent its oxidation. When meat oxidizes, it transforms its color

to brown. Ascorbic acid as a preservative delays the oxidation while keeping the meat fresh and appealing to consumers content.[12-14]

### **2.6 Favorable in drinks**

The processing and intense refining of beverages, fruit juices while they are crushed, pulped and filtered, depletes the naturally occurring vitamin C within the fruits. Therefore, the manufacturers of fruit juices, drink and other similar products generally prefer the use of ascorbic acids as a natural additive. It was studied for its use in juice and beverage. The acid enhances the nutritional value of the beverage without interference to its taste and preventing its spoilage.[15]

### **2.7 Proficient as a preservative**

Fruit when exposed to oxygen, start oxidation that transforms its color to brown. The fruits that turn brown are eventually discarded and rejected. The use of ascorbic acid slows down the oxidation with its low pH. The low pH of ascorbic acid contributes to prevent the microbial growth. Ascorbic acid resists browning, reduces microbial growth to preserve the freshness of the eatable while preventing its spoilage. [16,17]

### **2.8 Beneficial in pharmaceutical manufacturing and industry**

Ascorbic acid is used in wide range of industrial applications. Ascorbic acid and calcium and sodium ascorbates are used as antioxidants in pharmaceutical manufacturing. Ascorbic acid serves as assemble molecule that helps to bring about the chemical reaction. It enhances fermentation, serves as developing, reducing agent in reactions and as preservative in photo production. It helps in water purification where it helps masking the taste of iodine in sterilized and potable water. It is used in manufacturing plastic. Scientist use

ascorbic acid in fluorescence microscopy as an essential tool in understanding cell biology. Ascorbic acid helps to increase fluorescence, making the cells more visible to researchers. [18-20]

### **3. CONCLUSIONS**

Vitamin C is a versatile essential nutrient molecule. It induces growth and development of plants and animals. It is boon for agriculture sector as for plants, ascorbic acid functions as a major redox buffer and as a cofactor for enzymes involved in regulating photosynthesis, hormone biosynthesis and regenerating other antioxidants. It has numerable commercial, biological and nutraceutical applications. It renders tremendous advantages in dermal care, confectionary, water treatment, food industry and pharmaceutical manufacturing.

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