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## Efficacy of *Aloe vera* in human health especially against COVID-19

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**ABSTRACT:** *The world is full of enchanted natural flora and one of its charmed plant is Aloe vera. It showed the presence of number of novel compounds that engaged in multiple pharmacological activities and are in use to cure diseases. The present review of A. vera is currently about the debacles of COVID-19 i.e., its component involvement as stumbling block for virus proteases. It has also been noted as an effective anti-COVID cloth coating that will bio-actively lower the impact of differential microbe's expansion along with minimizing the spread of COVID-19. It boosts the immune system in variable circumstances potentially being an anti-inflammatory, anti-cancerous, anti-microbial and wound healing agent. A. vera has made drastic contributions regarding differential human ailments such as wound healing, dental issues, digestive complications, and skin diseases. Moreover, commercial applications of A. vera focuses on manufacturing of bioethanol and nutritionally engaging it in food. Furthermore, inquiries are being carried out to unfold the new wonders of this plant specifically against COVID-19.*

**Keyword:** *Aloe vera, Antimicrobial, covid-19, Anticancer, Pharmacology*

### INTRODUCTION

In traditional system, *A. vera* has been utilized therapeutically in Unani, Ayurveda, Siddha medicine and also in homeopathy since ancient times (Pathak and Sharma, 2017; Gupta et al., 2018). Due to therapeutic aims, in literature, *A. vera* has been endorsed with multiple names such as heaven's blessing, pharmacy in a pot, wand of heaven and also as the silent healer

(Gupta and Rarawt, 2017; Tiwari and Upadhyay, 2018). *A. vera* is succulent, perennial, xerophytic plant having pointed, serrated, lance shaped, fringed leaves in rosette configuration (Fig. 1A) (Minwuyet et al., 2017; Gupta et al., 2018). It belongs to arid and hot climatic regions (Rahman et al., 2017; Amin et al., 2018). This plant belongs to family Asphodelaceae, although, traditionally

there have been many contradictory views in literature about its family (Yohannes, 2018). It also expresses some relationship with Liliaceae family members such as garlic, turnip and onion families based on the possession of certain chemical constituents (Tiwari and Upadhayay, 2018).

*A. vera* leaves are basically categorized into 3 stratum; the outer most is the rind which has protective nature, the middle one is the sap which is yellow in color, bitter, with juice produced from cells present below epidermis of leaves comprises of glycosides and anthraquinone and the inner parenchymatous layer is mostly the crystal clear mucilage gel encompasses customarily polysaccharides (Fig. 1B).

(Minwuyelet et al., 2017; Yohannes, 2018). *A. vera* has long stalked flowers that extend beyond leaves, dazzling yellow color, tubular organized in loose spike form.

The plant accomplishes maturity in almost four years and ends its life cycle in 12 years (Abakar et al., 2017; Pathak and Sharma, 2017).

### 1.1. Potential Pharmacological Virtues of *A. Vera*

*A. vera* is the superlative naturally occurring medicinal plant in this whole realm being widely used in herbal medication as a vital therapeutic source for numerous ailments since historical times until in present times too.

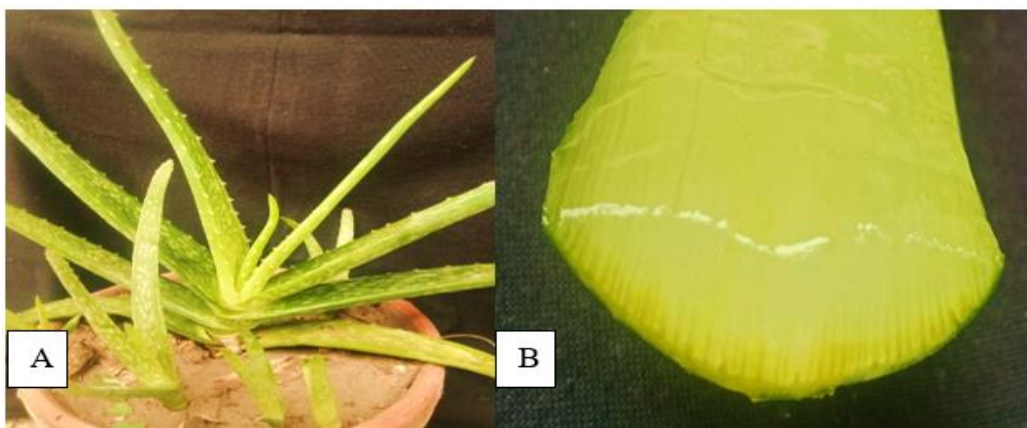


Fig. 1 A). *A. vera* plant      B). Leaf of *A. vera*: Inner parenchymatous gel layer

Also its voluminous biological activities have been pharmacologically approved and cited in literature various times for curing infirmities as arthritis,

analgesic, anemia, AIDS, anti-allergic, appetite stimulant, anesthetic, blood pressure, anti-biotic, anti-bacterial, cataracts, conjunctivitis, chronic

ulcers, anti-diabetic, diuretic, decoagulant, demulcent, digestive disorders, eczema, emollient, edema, anti-fungal, anti-inflammatory, gastrointestinal ulcers, heat burn, anthelmintic, hypoglycemic, hair stimulatory, insecticides, immune-stimulatory, liver stimulant, anti-leukemia, laxative, lowering blood lipid levels, mouth infections, migraine, anti-oxidant, psoriasis, parasitic killer, anti-pyretic, rejuvenating agent, radiation burns, skin disorders, anti-septic, skin cancer, tuberculosis, anti-tumor, tonic, anti-toxic, vaginitis, wound healing, and still many more. It is also being utilized as a vital ingredient for enhancing beauty in cosmetic merchandise in various ways such as in moisturizers, shampoos, facial products (Tiwari and Upadhayay, 2018).

### **1.2. A. vera as an Anti-Covid-19 Agent**

*A. vera* can exhibit anti-COVID-19 activity as reported in the Democratic Republic of Congo (Mpiana et al., 2020a). Through in-vitro studies, it was observed that the polymerase activity of RNA in arterivirus and coronavirus can be inhibited by Zn<sup>2+</sup> and also such viruses' replication in the cell culture can be obstructed by the ionophores of Zinc. Zinc is generally crucial as a co-factor of enzymes and it's intracellularly

increase blocks the reproduction of retroviruses involving the SARCoV-1 (Abiri et al., 2020; Mpiana et al., 2020a; Khan and Al-Balushi, 2021). In SARS coronavirus, aloe-emodin impedes the slitting of 3C-like protease and this enzyme is a key part of replication of virus by means of proteolytic mechanism at replicase phase (Mpiana et al., 2020a).

#### **1.2.1. COVID-19 Protease Inhibition**

Plants are the natural architect of viral inhibiting proteins through the expression of metabolites and the phenomenon of natural protease inhibitors at present are the best known therapies to combat COVID-19 (Origbemioye and Bamidele, 2020). The current research trend is to obstruct the key protease of COVID-19 (Mpro), a pharmacological prey by means of numerous secondary phytochemicals extracted from medicinal plant's one of them being *A. vera*. The virtual analysis of *A. vera* compounds as inhibitors for protease 3CLPro was carried out through ADMET and molecular docking process. The outcome of ADME is brought out by Lipinski's ruling of five which revealed that among the other ligand compounds feralolide is the most competitive against the drugs and has also been known for its anti-cancer, anti-fungal and anti-oxidant properties (Mpiana et al., 2020b). Another study has also reported

feralolide from *A. vera* as novel component for Mpro inhibition of SARS-COV-19 and its efficiency can be increased by substituting the hydroxyl group with each hydrogen of feralolide. This study done through molecular dynamic simulation techniques and ab initio fragment molecular orbital (FMO) calculations (Shaji et al., 2022). Also Aloe-resin and 9-dihydroxyl-2-O-(z)-cinnamoyl-7-methoxy-Aloesin are proven to be relatively effective for inhibition plus they are inclusive in the anti-inflammatory process. Such conclusions are founding the pathway for medical research based on herbal medication towards COVID-19 (Mpiana et al., 2020b).

In another study, *A. vera* has also proven to be a switching mode as herbal remedy for COVID-19 because in-silico molecular docking mechanism against viral cycle SARS-COV-2 comprising of Spike glycoproteins, RNA-dependent RNA-polymerase (RdRp) and main protease (Mpro), it has concluded that efficient retarding influence of *A. vera* components on proteases has observed constraining affinity towards the target regions (Khanna et al., 2020). It has proven that *A. vera* constituent's Catechin and Quercetin, uncovered great binding interactions with proteases and RNA-dependent RNA-polymerase, respectively showing

potential energies against the antiviral drugs (Pandit and Latha, 2020). The anti-viral metabolites in *A. vera* i.e., anthraquinones working alone or either synergistically with pharmaceutical drugs to attack the SARS-CoV-2 protease (CLPro) (Origbemioye and Bamidele, 2020). Aloe-emodin has also been studied as a barrier for biosynthesis of nucleic acid eventually blocking the production of proteins (Mpiana et al., 2020a). Emodin in *A. vera* combine with the S proteins of SAR-CoV preventing its entry into the host cells and also interrupting the 3CLpro capability of virus eventually stopping the synthesis of Nsp. The experimental trials have proven that specific concentrations of emodin can block the collaboration of ACE2 and SAR-CoV S-protein thus inhibiting the channels of 3a ion and interfering with the release of fresh coronaviruses (Llavisaca-Contreras et al., 2021). Jain (2020) have recently described that among many herbal plant extracts, *A. vera* extract had showed the utmost inhibiting activity against COVID-19 protease (6LU7).

### 1.2.2. *A. vera* as an Anti-COVID Cloth Coating

Health care workers are at utmost risk of COVID-19 in aspects of treating patients. They require special protecting coverings to secure themselves but that covers a lot of differential risky drawbacks. To

resolve this issue, currently varieties of green innovations are being utilized to manufacture antimicrobial clothing's specially antiviral to protect oneself from various diseases. Currently plant extracts are being selected for material coatings due to their bioactive, economical and eco-friendly nature by means of their significant anti-bacterial, anti-viral and anti-fungal aspects and one of them i.e., all in one possessing all these abilities is *A. vera*. The significantly abundant polysaccharides and anthraquinones in it are the key factors in anti-viral activities. Mechanically, *A. vera* physically inhibits the binding regions between the cells of host and virus.

The main resolve of *A. vera* coating is basically obstruction of virus on the surface through repelling its aerosol droplets. In its anti-viral mechanism's anthraquinones along with its derivatives actively impede the connotation of aminoacyl-transfer-ribonucleic acid (aa-t-RNA) and the ribosome of viral cell eventually hindering synthesis of proteins. All of this occurs due to the interaction between the negative charge of anthraquinones and its derivatives with the positively charged aa-t-RNA. Polysaccharides have showed lessen adsorption time and replication of virus in the in vitro studies. It has been declared that polysaccharides of acidic nature work by forming the

associations through their anti-adhesives and those comprising of high-pitched uronic acid of negative charge form an attraction with the t-RNA obstructing the preparation of proteins. Hence, it has been established that *A. vera* is a capable anti-COVID agent for cloth coating. Besides, *A. vera* dependent coatings will lessen the need of kits of PPE and multi-wrapped clothes eventually reducing the transmission of viral infections but still further investigation is under process for testing of anti-viral coatings to establish finalize conclusive remarks soon in future (Chauhan and Kumar, 2020).

Nanofibers are highly specialized in managing, blocking, deactivating the viral and microbial activities. These are considered to be potentially applicable in developing protective surgical clothing products such as masks, gloves, PPE, surgical and gowns etc. On this basis, several experiments are carried out using variable concentrations of *A. vera* with Polyvinyl Alcohol (AV/PVA) for developing electrospun fibers that possess highly effective anti-microbial properties and had shown strong repulsion and electrostatic force among the molecules that boost up due to the presence of H groups in Aloe gel and PVA ensuing the compactness of fiber molecules. Various experiments were also carried out by using these strategic

components demonstrating the effectiveness of AV/PVA fibers which was further modified and tested by using ZnO NPs. Electrospun nanofibers were prepared with variable concentrations of *A. vera* gel and fixed ZnO NPs, fix Aloe gel concentration and variable quantity of ZnO NPs, all these groups were tested against various microbes and affirmed by techniques such as SEM and FTIR (Khanzada et al., 2020; Montagner et al., 2021; Munir et al., 2022).

### **1.3. *A. vera* as Immune System Booster**

The immuno-modulation mechanism involves stimulation of cytokines by activation of lymphocytes which in turn enhances the action of macrophages (Origbemioye and Bamidele, 2020). The glycoproteins and macromolecular polysaccharides of *A. vera* has been described as immunomodulatory and immunoregulatory agents. Acemannan play their role in immunoregulatory action through macrophages initiation, production of cytokines TNF- $\alpha$  and IL-6, collectively working with interferon IFN- $\gamma$  thus promoting the liberation of NO, superficial antigens expression and thus eventually induction of morphological deviations of the cells (Gao et al., 2018). Acemannan advances the metabolism through standardizing cellular functions and modifying the nutrients flow and

regularizing the wastage movement of cells (Sushen et al., 2017).

### **1.4. *A. vera* as Anti-inflammatory Agent**

The mode of action of *A. vera* as anti-inflammatory agent is that it hinders the pathway of cyclooxygenase, lowers the production of E2 prostaglandin and hinders the linkage of pro-inflammatory cytokines and leukocytes. Anthraquinones of *A. vera* are the structural correspondent of tetracycline and it obstruct the site of ribosomal A in bacteria eventually inhibiting the synthesis of proteins. The presence of pyrocatechol in *A. vera* is proven to be lethal towards microorganisms (Paul et al., 2020).

*A. vera* possesses the enzyme peptidase bradykinase which collapses the bradykinin i.e., the key inflammatory element involved in causing pain. Bradykinase not only shuts down the bradykinin action but diminishes pain and also hastens the healing mechanism. C-glucosyl-chromone, a new element from *A. vera* extract, possesses sturdy anti-inflammatory action. Anti-prostaglandin components and sterols have been described as anti-inflammatory agents. Sterols have proved to be lessening inflammation effect by 37%. Lupeol is the utmost dynamic anti-inflammatory sterol (Pathak and Sharma, 2017; Maan et al., 2018; Mikołajczak, 2018;

Yohannes, 2018). It stops the relocation PMN neutrophil cells to the inflammatory tissues of vein as to inhibit the process (Suhardono et al., 2020).

### 1.5. *A. vera* as Anti-cancerous agent

Acemannan, anthraquinone and aloe emodin components of *A. vera* have the capability to conquer the malignant cancerous cells growth, affecting their assault, migration, hindering in cell proliferation, cyclic arrest, cell death initiation and modulating the signaling of the immune system. They seem to have their influence in the anti-neoplastic, pleiotropic and anti-proliferative way (Nazir and Ahsan, 2017; Mikołajczak, 2018). Juice of *A. vera* is also being reported as a contribute in curing cancer, also the mutilation by chemotherapy and radiotherapy since it annihilate the normal cells rudimentary of retrieval (Pathak and Sharma, 2017). Glycoproteins, barbaloin, aloesin and many other polysaccharides are seem to be involved in cytotoxicity activity to counter severe myeloid leukemia and lymphocytes leukemia cells (Minwuyelet et al., 2017; Maan et al., 2018).

### 1.6. Antimicrobial activity

Anthraquinone, dihydroxyanthraquinones, aloe emodin and saponins have been anticipated as possessing direct antimicrobial actions. A

polysaccharide element, acemannan indirectly enhances antimicrobial activity by stimulating phagocytic leukocytes (Dubey et al., 2017). Its acemannan and glucomannan compounds possess anti-bacterial action by soothing the immune system through enhancing macrophages. Anthraquinones express the anti-bacterial effect similar to strong antibacterial drug Tetracycline (Mikołajczak, 2018). Gupta (2017) has also verified that the solid referential existence of bactericidal activity is all because of dynamic combos of various pharmacological components i.e., aloe-emodin, anthraquinones, aloin, aloeride, antranol, anthracene, chrysophanic eroding, barbaloin, resistanol and saponin etc. Aloe-emodin and Aloin polyphenolic structural composition led them to suppress the protein unification of bacteria.

*A. vera* antiviral potential is basically due to the anthraquinones but several other compounds are also involved such as emodin, acemannan, quercetin, acyclovir, kaempferol, aloin and catechin hydrate which lay their art as an antiviral agent. Various minerals such as Ca, Co, K, Mg, Zn, and Fe found in *A. vera* also contribute to its anti-viral potential. Several compounds i.e., lectins, chrysophanic acid, acemannan, aloin, and aloe-emodin are present in *A. vera* have been identified

to participate in the anti-viral activity (Mpiana et al., 2020a). They have also been described in literature against different viruses such as Human papillomavirus, Cytomegalovirus, Poliovirus, Herpes Simplex virus type 1 and 2, HIV-1, Varicella-Zoster virus and Hemorrhagic Viral Rhodovirus Septicemia (Mpiana et al., 2020a; Abiri et al., 2021). Also, polysaccharides in *A. vera* gel are effective emollients against anti-viral infections, specifying *A. vera* as herbal cure (Demeke et al., 2021; Soleymani et al., 2022).

### 1.7. *A. vera* as Wound healer

*A. vera* polysaccharides principally acemannan is greatly cooperative in curing wounds by accelerating the synthesis of collagen, stimulating the activation of macrophages to release the fibrotic cytokines, producing hydroxyproline and hyaluronic acid in fibroblasts. It influences the collagen composition enhancing the cross-linking. Also *A. vera* comprises of 96% water that minimizes the drying of lesions plus surges the epithelial cells movement and keratinocytes (Gao et al., 2018; Mikołajczak, 2018). Amino acids and numerous electrolytes such as copper, calcium, chromium, iron, magnesium, potassium and zinc are present in *A. vera* playing a dynamic part in the process of wounds remedy. It excites the production of antibodies and

initiates the liberation of growth factors for healing of wounds. It fastens the healing process, averting the formation of scars, helping the creation of cells in the deeper films of skin (Maan et al., 2018).

Mannose, 6-phosphate in *A. vera* helps in curing the 1st and 2nd grade burns and wounds. In contrast to silver sulfadiazine, healing proportion is rapid almost one-half in response of mannose-6-phosphate (Gao et al., 2018). Glucomannan, a calmativive polysaccharide having moisturizing features and gibberellin hormone also play their part in wound healing (Dubey et al., 2017). All of these work in a similar way as compared to acemannan polysaccharide interacting together exciting the formation of collagen through in taking *A. vera* orally and topically (Pathak and Sharma, 2017; Upadhyay, 2018). Applying *A. vera* in topical way efficiently upsurge the dermatan sulfate and hyaluronic acid synthesis in the wound granulated tissue endorsing the healing of wound. Also collagen production is being enhanced through gibberellin and glucomannan (Giroh et al., 2019). *A. vera* has also been described as an effective substance to increase the re-epithelialization of cornea reducing the inflammation occur due to alkalotic burns although further studies are required to signify

this mechanism (Moghadam et al., 2020).

## 1.7. Green impact of *A. vera* for human health improvement

### 1.7.1. Dental ailments

Since old times, oral cleanliness is a significant part of individual welfare (Isadkar et al., 2018). *A. vera* usage for dental hygiene date back to 1700 and 3700 BC especially in the time of archaic Egyptians highlighting its curative possessions (Gupta, 2017). Anthraquinones were majorly involved in fighting against the mouth bacteria, reducing the inflammatory effects (Sushen et al., 2017). It has been found that *A. vera* was readily influential against different oral microbes such *Candida albicans*, *Lactobacillus acidophilus*, *Pseudomonas aeruginosa*, *Peptostreptococcus anaerobius*, *Prevotella intermedia* and *Enterococcus faecalis*. Also it has been reported that *A. vera* gel has been used to compose toothpastes and mouthwash which greatly exhibit anti-microbial activity (Gupta, 2017).

In dentistry, *A. vera* is being exploited for treating numerous dental problems such as periodontitis, cellular propagation of periodontal ligament, gingivitis, antedating halitosis, stomatitis, aphthous ulcers, oral sores, curing endodontic, specific cheilitis, collagen type I, positive growth factor differentiation, dental grafts, and

alkaline phosphate property in humans etc. It has been utilized in multiple forms such as tooth gel, denture cleansers, mouth wash and denture adhesives etc (Gupta, 2017; Isadkar et al., 2018; Salehi et al., 2019). *A. vera* reduces gum infections, edema of tissues and thus, subsequently bleeding of gums (Abdulwahhab and Jassim, 2018). The gel from *A. vera* has been considered as an endodontic being utilized as a biocompatible remedy for pulpal tissues (Maqbool et al., 2020).

Traditionally in old times, *A. vera* gel was mixed with charcoal for oral hygiene (Sushen et al., 2017). The mouthwash of *A. vera* was considerably effective for curing oral lichen planus and also helpful in reducing gingivitis and plaque (Deepthi and Kumar, 2018). Gibberellins and glucomannan in *A. vera* advances the potential of reinforcing fibroblast multiplication, quickening patching with epithelial tissues extension counteracting the diseases which delay the wound recovery (Gupta, 2017; Deepthi and Kumar, 2018). The lessening of gingiva through *A. vera* is attributed to the proximity of sterols as vindicating experts and also lupeol as sparkling pain reliever. It has been reported that *A. vera* lessens the chances of halitosis and clinically, local application of it is considerable in adjunctively treatment of scaling and planning of root in case

of lingering periodontitis (Gupta, 2017).

*A. vera* has also been a great medicament for burning oral syndrome, xerostomia, submucous fibrosis, candida denture stomatitis and radiation mucositis (Giroh et al., 2019). Acemannan the prominent starch, a composite mannose polymer in *A. vera* possesses influential regeneration activity and intuitive steadiness advances the curative action of dental area in humans through extracellular grid prearrangement, dental mesh cell development, parting and mineralization making it perfect for denture strengthening purposes. Acemannan in *A. vera* is found to be greatly involved in treating aphthous ulcer through reinforcing the growth of fibroblast cells to boost the recovery of ulcers, also endorses the generation of collagen by the process of mannose-6-PO<sub>4</sub> to fibroblast receptors. Barbaloins and alloins components are operative in lubrication case and in sedative covering. Also acemannan hydrogel decreases the prevalence of alveolar osteitis. Saponin specialize frothing is better for purifying purposes in aloe toothpaste and give equivalent results without enhancing the fluoride content (Gupta, 2017).

### **1.7.2. Anti-diabetic activity**

Polysaccharides in *A. vera* are involved in developing insulin level and expressing hypoglycaemic

possessions (Pathak and Sharma, 2017). *A. vera* basically lessen the disturbed lipid profiles and chronic hyperglycemia which are the main features of Diabetes mellitus, also influencing cardiovascular mellitus (Yohannes, 2018).

### **1.7.3. Digestive complications**

*A. vera* is greatly endorsed against multiple digestive issues such as stomach ulcers, indigestion, irritated bowl syndrome, heartburn, yeast formation, reassures digestive bacteria, reducing intestinal toxicity, constipation and many other gastrointestinal problems (Sushen et al., 2017; Mikołajczak, 2018). *A. vera* plays its part in curing gastric, silver, mouth, leg ulcers and sores where it influence in lessening the size of ulcer, exudation and erythema (Maan et al., 2018). *A. vera* anthraquinones are key ingredient being potential laxative agent through surges of intestinal peristalsis, intestinal water content and stimulating mucus secretion (Yohannes, 2018).

### **1.7.4. Skin dilemmas**

*A. vera* has sensational and wonderful influence on skin improving its integrity, reducing erythema and lines, healing pimples, enhancing fibroblast stimulation, increasing skin elasticity and softness. Its muco-polysaccharides are greatly involved in moisturizing the skin by increasing the moisture

binding potential of skin. Amino acids are helpful in giving softness while zinc causes the pores tightness (Minwuyelet et al., 2017; Gao et al., 2018). In cosmetics, 95% dermatologist products have essential extracts which involve *A. vera* as a core ingredient in them (Sushen et al., 2017).

#### **1.7.4. Reproductive Improvement**

It has been reported that *A. vera* plant that comprises of some phyto-estrogenic components influencing the estrogen levels in a positive way leading the growth of follicles as effective as the

sexual hormones and these compounds reduces the hormone levels of LH and FSH. In male rats' studies, it has been concluded that it causes certain histological differences in testis surging the content of Sertoli cells, spermatids, spermatocytes and spermatogonia (Koshkaki et al., 2020).

### **1.8. Commercial Applications of *A. vera***

#### **1.8.1. Bioethanol production**

The leaf rind of *A. vera* has proven to be a capable source for the production of bioethanol. The biomass of its leaf rind cellulose has also been used to produce cellulosic nanofibers and also acid-hydrolyzed leaf rind biomass utilization has also been reported to analyze its potential for bioethanol

manufacturing (Rajeswari and Jacob, 2020).

#### **1.8.2. Usage in beverages**

The juice of *A. vera* is useful in making of several beverages such as in papaya beverage formation, it is being used in a different blended ratio for a ready to serve (RTS) beverage and this will have better storage efficiency and quality. In mango nectar, *A. vera* is basically a core component in improving its potential and quality features and can be stored up to 6 months. It is also being used in the preparation of herbal wines and possesses better anti-bacterial activity against the common pathogens of food. *A. vera* products basically involve it in a variety of concentrations and combinations in numerous food applications. The concentrated quantity *A. vera* is present in jams and jellies, cakes, also in mixtures with water and teas. The fillet of gel is available in chewing gums, candies, bars, prompt tea granules and fruit smoothies. Its juice exists in different types of drinks such as sports drink, soft drink, vegetable mixtures juice, alcohol and whiskey, dairy products i.e., probiotics dahi and lassi. Powder of *A. vera* occur in ice-cream, curds, lassi, yoghurt and laddu (Kukreti et al., 2016).

#### **1.8.3. Food supplements**

Variable compositions of *A. vera* in different dosages is present in food

supplements available in market. *A. vera* (99%) extract (30ml) can be taken twice per day for multipurpose as a supplement. Its fibrous juice is used as a dietary enhancement purpose (20ml to 30ml diluted with in equal quantity). Simple juice of 30ml utilized only one time is purposed for various digestive disorders. Pure juice of *A. vera* (98%) dosage 30ml, used once a day is meant for immunomodulation, antioxidants and also as a storehouse for nutrients. Purified extract (100%) in capsules, only 5 per day can heal the internal intestinal complications (Mulay and Ogale, 2018).

### 1.8.4. Food coatings

*A. vera* can also be demonstrated as efficient source of ecofriendly antimicrobial coatings for biomedical products because it has been studied that *A. vera* pristine Pluronic merged solution possess effective antimicrobial potential enhancing the structural and physical properties of it (Seifunnisha and Shanthi, 2020). *A. vera* gel has been widely used as an edible source of coatings for different fruits being whole, fresh-cut or in raw ones e.g., in grapes, strawberries, plums, apples, litchis, papayas, cherries, mangoes etc. The gel basically reduces the synthesis levels of ethylene, activities of peroxidases, and polyphenol oxidase. It also lessens the fungal effect and browning on fruits. Besides, being an edible source

of coating, it comprises of vitamins acting as antioxidants and several amino acids for essential humans (Farina et al., 2020a, b). The fruit coatings inclusive of polysaccharide as key component are greatly operational in inhibiting the transfer of gases, lowering the rate of respirations, having less toxic effects and are being biodegradable. Currently, nano-coatings are being highly considered due to their great adhesive potential (Suriati, 2022). Recently, it has been studied that the combination of *A. vera* gel with lemongrass essential oil in variable concentrations showed significant results for edible fruit coating in strawberry by reducing acidity, maintaining firmness of fruit, resisting microbial growth and also increasing the fruit shelf life for storing it (Hassan et al., 2022).

## CONCLUSION

The outcome of current investigation has revealed that *A. vera* secondary metabolites are a vital ingredient of various activities and have been proved through literature especially in certain actions for boosting the immunity. *A. vera* had been an efficient stone mark of health strength in various cases and it has been utilized through historical times until now. Several recent discoveries in the past few years are also being carried out to prove its impact on human health pharmacologically although

been employing it for extended time and improvising its commercial utilization. Most radically, *A. vera* anti-viral association with COVID-19 which has shaken the world health system to its core, has led to a remarkable twist in the pharmacological way of drug development and also its herbal cure, however in this regard, further significant molecular evidences are required to provide its influencing facts and mechanisms.

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