



A COMPARATIVE STUDY ON THE EFFECT OF ALOE VERA EXTRACT ON FRUITS AND FRUIT MOULDS

Shrishti Rathore and Judia Harriet Sumathy V

Department of Biotechnology, Women's Christian College, University of Madras, Chennai, India

ARTICLE INFO

Article History:

Received 4th November, 2018

Received in revised form 25th

December, 2018

Accepted 18th January, 2019

Published online 28th February, 2019

Key words:

Aloe Vera, Skin Lotion, Phytochemical Analysis, Anti-bacterial properties Fruits and Fruit Moulds.

ABSTRACT

Aloe Vera is a succulent plant species of the genus Aloe. Its originates from the Arabian Peninsula but grows wild in tropical climates around the world and is cultivated for agricultural and medicinal uses. The species is also used for decorative purposes and successfully indoors as potted plant. It is found in many consumer product including beverages, skin lotion, cosmetics, or ointments for minor burns and sunburns. Aloe Vera is a stem less or very short – stemmed plant growing to 60-100cm tall, spreading by offsets. The leaves are thick and fleshy, green to grey-green, with some varieties showing white flecks on their upper and lower stem surface. The margin of leaf is serrated and has small white teeth. The flowers are produced in summer on a spike up to 90 cm tall, each flower being pendulous, with yellow tubular corolla 2-3cm long. Phytochemical analysis of Aloe Vera reveals that almost all chemical constituents are present such as Tannin, Flavonoids, Saponins, and Anthraquinones which are used in medicinal field. Hence it is used in traditional medicine for constipation, skin diseases, worm infestation, and infections and as a natural remedy for colic. In Chinese medicine, it is often recommended in the treatment of fungal diseases. The present study confirms that Aloe vera possesses Anti-bacterial properties with evidence from the fruit sample taken such as apple, strawberry and kiwi.

Copyright©2019 Shrishti Rathore and Judia Harriet Sumathy V. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Aloe Vera produces two substances which are used for medicine: the **gel** is obtained from the cells in the centre of the leaf, and the **latex** is obtained from the cells just beneath the leaf skin [1]. Aloe gel is used for treating osteoarthritis, bowel diseases, fever, itching and inflammation [2]. It's also used as a treatment. Aloe latex is used to naturally treat depression, constipation, asthma, and diabetes [3].

Scientific Classification

Kingdom : Plantae
Class : Monocotyledons
Order : Asparagales
Family : Asphodelaceae
Subfamily : Asphodeloideae
Genus : *Aloe*
Species : *vera*

Apple

An apple is a sweet, edible fruit produced by an apple tree, *Malus pumila*. Apple trees are cultivated worldwide as fruit trees and are the most widely grown species in the genus *Malus*. Almost all chemical constituents such as Tannin,

Saponins, Flavonoids, Anthraquinones, Terpenoids, Carbohydrates, protein, cardiac glycoside, alkaloids are present in Apple. It is believed to reduce Hay Fever, Prevent Hair Loss, reduce the risk of Cancer and helps in reducing weight [4].

Fig

The screening of Phytochemical analysis of Fig shows that almost all chemical constituents such as Tannin, Saponins, Flavonoids, Anthraquinones, Terpenoids, Carbohydrates, protein, cardiac glycoside, alkaloids to be present. The health benefits of figs or anjeer include its treatment of sexual dysfunction, constipation, indigestion, piles, diabetes, cough, bronchitis and asthma. Figs are also used as a quick and healthy way to gain weight after illness. The fibres of figs help reduce weight and often recommend for obese people. The figs also lower the cholesterol levels. Dried figs contain phenol, omega-3 and omega-6 fatty acids. These reduce the risk of coronary heart diseases also offers protection against breast cancer.

Strawberry

The benefits of consuming strawberry are reducing the risk of heart disease and diabetes. A high intake of strawberry keeps skin and hair healthy, increased weight loss and improvement in constipation. It's also reduces the formation of harmful blood clots associated with stroke.

*Corresponding author: Shrishti Rathore

Department of Biotechnology, Women's Christian College, University of Madras, Chennai, India

Kiwi

The screening of phytochemical analysis of kiwi shows that almost all chemical constituents such as Vitamin C, Tannin, Saponins, Flavonoids, Anthraquinones, Terpenoids, Carbohydrates, protein, cardiac glycoside, alkaloids to be present.

Asthma: There is evidence that eating vitamin C rich citrus fruits, including kiwi, once or twice per week might improve lung function in people with asthma. It helps in preventing constipation, eating three kiwi fruits per day for 8 weeks can reduce blood pressure more than apple.

Tomato

The screening of Phytochemical analysis of tomato shows that almost all chemical constituents to be present such as Vitamin C, Tannin, Saponins, Flavonoids, Anthraquinones, Terpenoids, Carbohydrates, protein, cardiac glycoside and alkaloids. It also shows Anti- bacterial properties Tomato prevents bladder cancer, breast cancer and diabetes. Tomato is associated with a lower chance of developing cervical cancer. It also prevents stomach cancer and tomato extracts lowers the blood pressure in people. It also reduces the asthma attack after or during exercise. It also cures arthritis, common cold and digestive disorders [5 – 12].

MATERIALS AND METHODOLOGY

Extraction for Aloe Vera

The leaves of Aloe Vera were washed to remove dirt's and impurities. The gel in the leaves were removed and kept in the refrigerator. Some of the leaves were dried for two weeks under low sun intensity, crushed in a mortar and further ground into a coarse powder by using an automated grinder. The coarse powder was stored for the extraction of the sample.

Procedure Used for the Extraction

- Soxhlet extraction method using chloroform as the solvent.
- Aqueous extraction method using water as the solvent.

Qualitative Phytochemical studies for Phenol, using standard protocols. Saponins, Flavonoids, Terpenoids, Carbohydrates, Proteins, Anthraquinones, Cardiac Glycosides, Alkaloids and Quantitative Phytochemical analysis for Proteins, Carbohydrates and Phenols were carried out using Standard Protocols. Besides this Antimicrobial studies, Gram Staining, Motility Study By Hanging Drop Method, Biochemical Tests and Pectinase Assay were also carried out.

RESULTS AND DISCUSSION

Aloe Vera Gel Effect on Fresh Fruits

Apple, Strawberry and Kiwi showed positive results (not spoilt) when coated with aloe vera gel, whereas, Fig and tomato showed negative results (Table 1).

Fruits	Aloe Vera Gel coated fruits	Uncoated with aloe Vera Gel
Apple	-	+
Fig	-	+
Strawberry	-	+
Kiwi	+	+
Tomato	+	-

+ Presence of Spoilage
- Absence of Spoilage

Qualitative Phytochemical Screening of Aloe Vera

Qualitative phytochemical analysis of aloe vera gel extracted using Chloroform and aqueous extract showed the presence of Carbohydrate, Tannis, Flavonoids, Saponins, Proteins, Anthraquinone and Alkaloids, but absence of Terpenoids and Cardiac Glycosides (Table 2).

Table 2 Qualitative Phytochemical Analysis of Aloe Vera

Phytochemical test	Chloroform extract	Aqueous extract	Interference
Carbohydrate	+	+	Formation of brown colour
Tannis	+	+	Formation of white colour
Flavonoids	+	+	Formation of yellow
Terpenoids	-	-	No formation of grey colour
Saponin	+	+	Produce foam
Protein	+	+	Formation of blue colour
Anthraquinone	+	+	Formation of pink colour
Cardiac glycoside	-	-	No formation of reddish brown
Alkaloid	+	+	Formation of yellow white colour

+ Present
- Absent

Qualitative Phytochemical Screening of Fresh Fruits

Qualitative phytochemical analysis on fresh fruits showed the presence of Carbohydrate, Tannis, Flavonoids, Saponins, Proteins, Anthraquinone, Alkaloids, Terpenoids and Cardiac Glycosides (Table 3).

Table 3 Qualitative Phytochemical analysis of Fresh fruits

Phytochemical test	Apple	Fig	Strawberry	Kiwi	Tomato	Interference
Carbohydrate	+	+	+	+	+	Formation of brown colour
Protein	+	+	+	+	+	Blue colour form
Flavonoids	+	+	+	+	+	Orange colour formation
Saponins	+	+	+	+	+	Formation of foam
Anthraquinone	+	+	+	+	+	Formation of pink colour
Cardiac glycoside	+	+	+	+	+	Formation of reddish brown colour
Terepenoids	+	+	+	+	+	Formation of grey colour
Phenol Alkaloid	+	+	+	+	+	Green colour

+ Present
- Absent

Qualitative Phytochemical Screening of Spoiled Fruits

Qualitative phytochemical analysis on Apple showed the presence of Carbohydrate, Proteins, Flavonoids, Saponins and Anthraquinone, and showed absence of Cardiac Glycosides, Terpenoids, Phenol and Alkaloids. Qualitative phytochemical analysis on Fig showed the presence of Carbohydrate, Proteins, and Flavonoids, and absence of Saponins, Anthraquinone, Cardiac Glycosides, Terpenoids, Phenol and Alkaloids. Qualitative phytochemical analysis on Strawberry showed the presence of Carbohydrate, Proteins, and

Flavonoids, and absence of Saponins, Anthraquinone, Cardiac Glycosides, Terpenoids, Phenol and Alkaloids. Qualitative phytochemical analysis on Kiwi showed the presence of Carbohydrate, Proteins and Saponins, and absence of Flavonoids, Anthraquinone, Cardiac Glycosides, Terpenoids, Phenol and Alkaloids. Qualitative phytochemical analysis on Tomato showed the presence of Carbohydrate, Proteins, Flavonoids, Saponins, Anthraquinone, Cardiac Glycosides, Terpenoids, Phenol and Alkaloids (**Table 4**).

Table 4 Qualitative Screening of Spoilt Fruits

Phytochemical test	Apple	Fig	Strawberry	Kiwi	Tomato	Interference
Carbohydrate	+	+	+	+	+	Formation of brown colour
Protein	+	+	+	+	+	Blue colour form
Flavonoids	+	+	+	-	+	Orange colour formation
Saponins	+	-	-	+	+	Formation of foam
Anthraquinone	-	-	-	-	+	Formation of pink colour
Cardiac glycoside	-	-	-	-	+	Formation of reddish brown colour
Terpenoids	-	-	-	-	+	Formation of grey colour
Phenol	-	-	-	-	+	Green colour
Alkaloids	-	-	-	-	+	Yellow white colour

+ Present
- Absent

Qualitative Phytochemical Screening of Aloe Vera Coated Fruits

Qualitative phytochemical screening of aloe vera gel coated fruits showed the presence of Carbohydrate, Proteins, Flavonoids, Saponins, Anthraquinone, Cardiac Glycosides, Terpenoids, Phenol and Alkaloids (**Table 5**).

Table 5 Qualitative Phytochemical screening of aloe vera gel coated fruits

Phytochemical test	Apple	Fig	Strawberry	Kiwi	Tomato	Interference
Carbohydrate	+	+	+	+	+	Formation of brown colour
Protein	+	+	+	+	+	Formation of blue colour
Flavonoids	+	+	+	+	+	Formation of orange
Saponins	+	+	+	+	+	Formation of foam
Anthraquinone	+	+	+	+	+	Formation of pink colour
Cardiac glycoside	+	+	+	+	+	Formation of reddish brown
Terpenoids	+	+	+	+	+	Formation of grey colour
Phenol	+	+	+	+	+	Formation of green colour
Alkaloid	+	+	+	+	+	Formation of cream colour

+ Present
- Absent

Quantitative Phytochemical Screening of Fresh Fruits

The results of the quantitative Phytochemical screening of fresh fruits are given in **Table 6**.

Table 6 Quantitative Phytochemical Screening of Fresh Fruits

Estimation	Apple (mg/ml)	Fig (mg/ml)	Strawberry (mg/ml)	Kiwi (mg/ml)	Tomato (mg/ml)
Protein	34	50	25.5	32.5	35
Carbohydrate	28	24	15.6	30	30
Flavonoids	9	4	8	7	5
Phenol	10	28.8	31.2	32.8	8

Quantitative Phytochemical Screening of Spoiled Fruits

The results of the quantitative Phytochemical screening of spoilt fruits are given in **Table 7**.

Table 7 Quantitative Phytochemical Screening of Spoilt Fruits

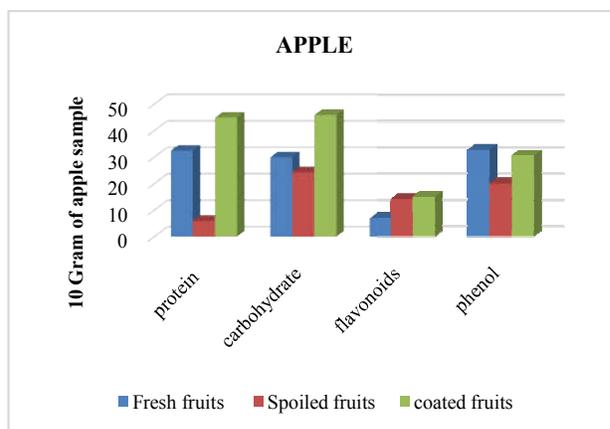
Estimation	Apple (mg/ml)	Fig (mg/ml)	Strawberry (mg/ml)	Kiwi (mg/ml)	Tomato (mg/ml)
Protein	7	6	18	6	15
Carbohydrate	21.6	11.6	5.6	24.4	72.5
Flavonoids	2	4	2	14	3
Phenol	10	7.6	6.3	20	38

Quantitative Phytochemical Screening of Aloe Vera Coated Fruits

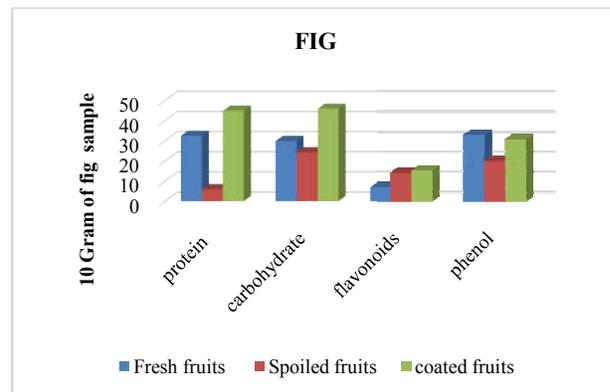
The results of the quantitative Phytochemical screening of aloe vera gel coated fruits are given in **Table 8 & Graphs 1 – 5**. The Graphical Representation of the following are given below (**Graphs 1- 5**).

Table 8 Quantitative Phytochemical Screening of Aloe vera gel coated fruits

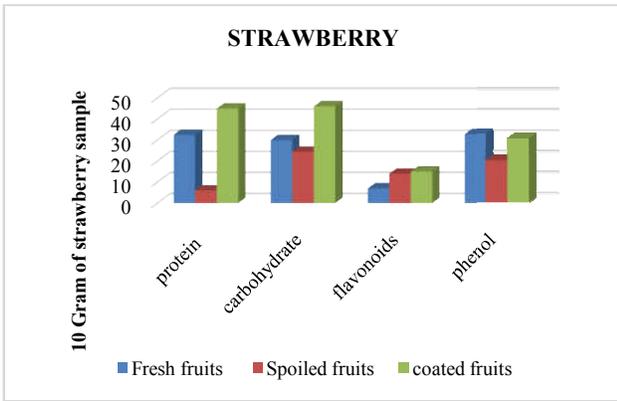
Estimation	Apple (mg/ml)	Fig (mg/ml)	Strawberry (mg/ml)	Kiwi (mg/ml)	Tomato (mg/ml)
Protein	42	45	30	45	15
Carbohydrate	51.2	10	72	46	14
Flavonoids	13	17	16	15	4
Phenol	47	9.6	30.3	30.6	5



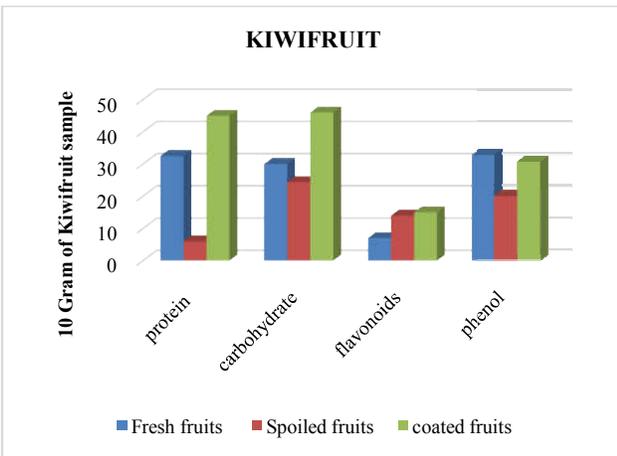
Graph 1 (Apple – 10 gram of apple sample)



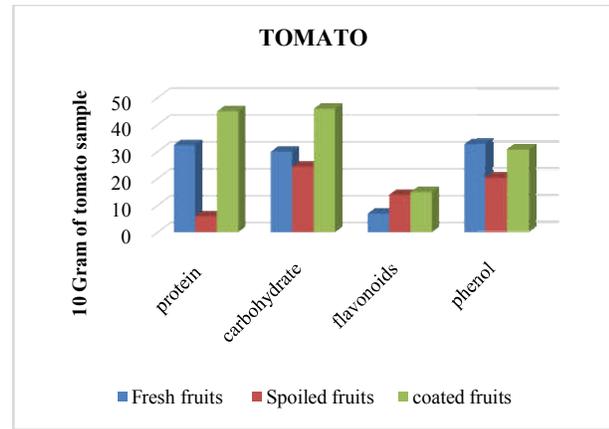
Graph 2 (Fig – 10 gram of fig sample)



Graph 3 (Strawberry – 10 gram of strawberry sample)



Graph 4 (Kiwifruit- 10 gram of kiwi sample)



Graph 5 (Tomato -10 gram of tomato sample)

The Anti – bacterial screening of Aloe vera coated fruits, Fresh fruits and Spoilt fruits are given in Tables 9 - 12.

Table 9 Anti-bacterial screening of Aloe vera

Microbes	Chloroform extract	Aqueous extract
<i>Escherichia coli</i>	10mm	9mm
<i>Pseudomonas aeruginosa</i>	15mm	8mm
<i>Staphylococcus aureus</i>	20mm	10mm
<i>Klebsiella pneumonia</i>	13mm	3mm
<i>Salmonella typhi</i>	17mm	7mm
<i>Streptococcus mutans</i>	13mm	10mm
<i>Enterobacteria.</i>	12mm	8mm

Table 10 Anti –bacterial Screening in Fresh Fruits

MICROBES	Apple (mm)	Fig (mm)	Strawberry (mm)	Kiwi (mm)	Tomato (mm)
<i>Escherichia coli</i>	9	16	8	10	15
<i>Pseudomonas aeruginosa</i>	8	20	15	8	5
<i>Staphylococcus aureus</i>	10	12	10	7	16
<i>Klebsiella pneumonia</i>	10	10	7.5	13	18
<i>Salmonella typhi</i>	17	15	5	7.5	12
<i>Streptococcus mutans</i>	12	10	5	15	20
<i>Enterobacteria.</i>	13	13	15	11	25

Table 11 Anti-Bacterial Screening For Spoiled Fruits

MICROBES	Apple	Fig	Strawberry	Kiwi	Tomato
<i>Escherichia coli</i>	-	-	-	-	-
<i>Pseudomonas aeruginosa</i>	-	-	-	-	-
<i>Staphylococcus aureus</i>	-	-	-	-	-
<i>Klebsiella pneumonia</i>	-	-	-	-	-
<i>Salmonella typhi</i>	-	-	-	-	-
<i>Streptococcus mutans</i>	-	-	-	-	-
<i>Enterobacteria</i>	-	-	-	-	-

- Absence of Zone

Table 12 Anti-Bacteria Screening For Aloe Vera Coated Fruits

Microbes	Apple (mm)	Fig (mm)	Strawberry (mm)	Kiwi(mm)	Tomato (mm)
<i>Escherichia coli</i>	20	-	16	20	-
<i>Pseudomonas aeruginosa</i>	30	-	20	17	-
<i>Staphylococcus aureus</i>	20	-	12	30	-
<i>Klebsiella pneumonia</i>	20	-	10	25	-
<i>Salmonella typhi</i>	16	-	15	28	-
<i>Streptococcus mutans</i>	15	-	10	19	-
<i>Enterobacteri a.</i>	30	-	13	30	-

- Absence of Zone

Isolation of Microorganisms From Spoiled Fruits

Gram staining of microorganisms A and B showed Gram Negative Rod shaped Bacteria.

Biochemical Test

The Results of the Biochemical Tests are given in Table 13.

Table 13 Biochemical Tests

Biochemical test	Microorganism A	Microorganism B
Gram staining	Gram negative –rods	Gram negative –rods
Catalase test	Positive	Positive
Oxidase test	Negative	Negative
Citrate test	Negative	Negative
Triple sugar iron test	Glucose fermentation negative H ₂ S, no gas	Glucose fermentation, positive H ₂ S, no gas
Methyl red test	Positive	Positive
VP test	Negative	Negative
Indole test	Positive	Positive
Motility test	Motile	Motile
Maconkey plate and lactose test	Pink colour colonies lactose positive	Pink colour colonies Lactose positive

According to above results, the *E.coli* bacteria affected the fruits to spoil without Aloe Vera coat and hence it can be concluded that Aloe Vera gel prevents the fruits from spoilage by *E.coli* bacteria.

Pectinase Assay

The specific activity of pectinase in apple was found to be 1,600 IU and in Fig 2,300 IU (Table 14).

Table 14 Pectinase Assay

Fruits	Specific Activity of Pectinase
Apple	1,600 IU
Fig	2,300 IU

CONCLUSION

Aloe Vera is a succulent plant which shows anti-microbial and anti-oxidation activity and is also used in medicine. Aloe Vera gel is best known for its therapeutic effect on burned or defect skin. The coating of Aloe Vera gel prolongs the quality and safety of fresh fruits and vegetable. The gel coating on fruits and vegetable does not appear to affect fruits taste or appearance, and shows promise as a safe natural. Further qualitative and quantitative phytochemical screening was done for Aloe Vera to know its properties. The Biochemical test and Gram staining was done to identify which microorganism is effecting the non-coated Aloe Vera fruits and the results were recorded. The Aloe Vera enhances the properties of the Aloe Vera coated fruits. Thus the present study confirms Aloe Vera gel to possess anti-microbial effect against bacteria causing spoilage of Fruits besides being a healthy edible plant species. The application of the Aloe Vera gel on the fruits showed that apple, strawberry, kiwi do not show effect towards the bacteria where as Aloe Vera coat on fig and tomato prevents from Spoilage. This study was conducted to study the properties of fresh fruits and coated fruits and non-coated fruits of Aloe Vera. The qualitative phytochemical studies of fresh fruits and Aloe Vera coated fruits showed the presence of carbohydrate, protein, saponins, cardiac glycoside, phenol, tereponoids, alkaloids, flavonoids, anthraquinones whereas the spoiled fruits showed the presence of carbohydrate, protein, flavonoids, phenol and saponins. Fresh fruit show the antibacterial properties by the zone of inhibition whereas Aloe Vera coated fruits showed anti-bacterial properties by a high zone of inhibition. The spoiled fruit didn't show any anti-bacterial properties. Gram staining and biochemical tests show that the *E.coli* bacteria resulted in the spoilage of non-coated fruits. Hence the study confirms that Aloe vera possesses Anti-bacterial properties with evidence from of apple, strawberry and kiwi fruits.

Bibliography

1. Jawadul Misir, Fatema H, Brishti, Hoque MM. Aloe Vera gel as novel edible coating for fresh fruit. *America Journal of Food and Technology*. 2009; 2 : 93-97.
2. Amar Surjaushe, Reshma Vasani, Sale DG. Introduction of aloe vera, apple, fig, strawberry, kiwi and tomato, *Indian Journal of Dermatology*. 2000; 45 – 62.
3. Mander Mulik, Mitesh Phale. Extraction of aloe vera gel. *International Journal of Science and Research (IJSR)*. 2000; 5 : 1-5.
4. Rahman Gul, Syed Umer Jan, Syed Faridullah. Qualitative phytochemical screening of plant extract. *The Scientific Journal*. 2000; 3 : 1-7.
5. Anahony, T.Darbas, H.Ongaro, Jean Pierre O. Medical uses and side effect of Aloe Vera, Apple, Fig, Strawberry, Kiwi, and Tomato. 1998; 11 : 32-36.
6. Esther Lydia, Mohammed Riyazudin, Sheila John, Shivapriya. *International Journal of Health and Science*. 2000; 5: 247-252.
7. Tankeshwar. Bacteriology, Staining Technique in Microbiology. 2006; 23 – 30.
8. Patricia Shields, Laura Cathcart. Oxidase test – Procedure, Result. 2010; 5: 20-70.
9. Prasil Pradhan. Citrate Utilisation Test, Dept. of Microbiology, JJMMC. 2011; 3: 1-3.
10. Prasil Pradhan. MR –VP test, Dept. of Microbiology, JJMMC. 2013; 7: 1-3.
11. Pratiksha Pokhrel. Gelatine Test, Mycology Laboratory. 2015 ; 5: 3-6.
12. Alessandra Biz, Fernanda Farias, Francine, David Alexander. Pectinase assay. 2010; 7 : 4-6.

How to cite this article:

Shrishti Rathore and Judia Harriet Sumathy V (2019) 'A Comparative Study on the Effect of Aloe Vera Extract on Fruits and Fruit Moulds', *International Journal of Current Advanced Research*, 08(02), pp.17577-17581.
DOI: <http://dx.doi.org/10.24327/ijcar.2019.17581.3340>
