

**VIVEKANAND COLLEGE, KOLHAPUR**

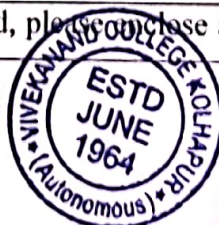
**(Empowered Autonomous)**

**SEED MONEY SCHEME FOR RESEARCH**


**Annual/Final Report of the work done on the Research Project**

- 1) Project report No. 1<sup>st</sup>/2<sup>nd</sup> (Final) - 1<sup>st</sup>
- 2) University Reference No. -
- 3) Period of report : from - 01 /11/2022 to 31/10/2023
- 4) Title of research project - "To Improve the Shelflife of Perishable Fruit-Vegetables by Applying Natural Polymers".
- 5) a) Name of the Principal Investigator - Dr. Annapurna Ram Alvikar  
b) Dept. And College where work has progressed – Dept. of Botany, Vivekanand College, Kolhapur (Empowered Autonomous)
- 6) Effective date of starting of the project - 01 /11/2022
- 7) Grant approved and expenditure incurred during the period of the report:
  - a. Total amount approved Rs. - 120000/-
  - b. Total expenditure Rs. - 8500/-
  - c. Report of the work done: Attached separate sheet

1.	Brief Objective of the Project	Annexure - A
2.	Work done so far and results achieved and publications, if any, resulting from the work (Give details of the papers and names of the journals in which it has been published or accepted for publications)	Annexure - B
3.	Has the progress been according to original plan of work and towards achieving the objective, if not state reasons.	Yes
4.	Please indicate the difficulties, if any, experienced in implementing the project.	No
5.	If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the university on a separate sheet.	Ongoing
6.	If the project has been completed, please send a summary	Ongoing



	of the findings of the study. Two bound copies of the final report of work done may also be sent to the University	Ongoing
7.	Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as a) Manpower trained b) Ph. D awarded c) Publication of results d) other impact, if any.	Two students were trained, one publication was done in IJFNS Journal, the other remaining work is in progress.

  
Signature of the Principal Investigator :

(Dr. Annapurna. R. Alvilkar)

  
Signature of the Principal

PRINCIPAL  
VIVEKANAND COLLEGE, KOLHAPUR  
(EMPOWERED AUTONOMOUS)



"To Improve the Shelflife of Perishable Fruit- Vegetables by Applying Natural Polymers".

Dr. Annapurna R. Alvikar

**1. i) Brief Objective of the Project**

1. Isolation, Separation, Characterization, Application.
2. Application of various natural polymers for preservation of vegetables.
3. To apply the mucilage as a natural polymers coating for various purposes.

**ii) Methodology**

- Isolation
- Separation
- Characterization
- Application

**iii) Year wise Plan of work and targets to achieve.**

One year – Collection, Isolation, Separation

Second year – Characterization and Application and Results.



Signature of the Principal Investigator :

(Dr. Annapurna R. Alvikar)



## Report of the Work done

Annexure - B

“To Improve the Shelflife of Perishable Fruit- Vegetables by Applying Natural Polymers”.

Dr. Annapurna R. Alvikar

Fifty percent of the work has been completed and a hard copy of the published research paper is attached.

**Alvikar Annapurna R.** (December 2023). Control of Post harvest waste of “*Capsicum annum*” by Application of Natural Polymer glazer. *International Journal of Food and Nutritional Sciences*, Volume 12, Issue 07, 51-56.

The application of mucilage as a natural polymers, extracted from the waste flowers of avenue roadside plants would be helpful in maintaining the quality of harvested vegetables as well as it might be helpful to reduce the losses caused during post harvest transport. The natural coater was prepared with the application of mucilage powder along with protein, lipid complexes. *Spathodea campanulata* mucilage improves the water content, relative water content, succulence and osmotic potential of *Capsicum annum*, this will helpful to maintain the turgidity of fruits. The natural coater when applied to these *Capsicum annum*, the postharvest shelf-life of vegetables increased, while due to presence of significant bonds of starch in the region of 1200 to 700cm<sup>-1</sup> and also turgidity is a sign quion of freshness of vegetables and fruits. The application of various concentrations of natural coater to *Capsicum annum* significantly improves the turgidity and water content of vegetables. This will helps to maintain the freshness and shelf life of *Capsicum annum*. The further deterioration of the fruit during the storage of postharvest period of *Capsicum annum* is useful in the improvement of the shelf-life and freshness of the vegetables during the course of marketing. Thus the application of *Spathodea campanulata* mucilage coating is beneficial for the



post-harvest of the *Capsicum annuum* in future. Mucilage had good swelling properties and viscosity of such type that is suitable for formulation of gel, jellies, cream and other semisolid drug dosage forms. Also dried mucilage has a good flow properties which is suitable for a direct compression formulation. FTIR a study was indicates groups present, Type of compound and bonds present in mucilage flowers of *Spathodea campanulata*. The natural polymers are cheaper, biodegradable and easily available which will reduce the biocompatibility and biomagnifications of synthetic chemicals. These polymers also increase the period of drug release which will be found beneficial for the drug delivery. Thus the present work will be helpful to know the sources of plant based natural polymers which can be very easily utilized by pharmaceutical, cosmetic, textile and agricultural industries.



A handwritten signature in blue ink, appearing to read "Annapurna R. Alvikar".

Signature of the Principal Investigator :

(Dr. Annapurna. R. Alvikar)



## Control of Post harvest waste of "*Capsicum annuum*" by Application of Natural Polymer glazer

Dr. Alvikar Annapurna R.

Department of Botany, Vivekanand College Kolhapur, (Empowered Autonomous) (416003),  
Maharashtra, India  
[alvikar2112botany@gmail.com](mailto:alvikar2112botany@gmail.com)

### Abstract

Thus, the application of mucilage as a natural polymers, extracted from the waste flowers of avenue roadside plants would be helpful in maintaining the quality of harvested vegetables as well as it might be helpful to reduce the losses caused during post harvest transport. The natural coater was prepared with the application of mucilage powder along with protein, lipid complexes. *Spathodea campanulata* mucilage improves the water content, relative water content, succulence and osmotic potential of *Capsicum annuum*, this will helpful to maintain the turgidity of fruits. The natural coater when applied to these *Capsicum annuum*, the postharvest shelf-life of vegetables increased, while due to presence of significant bonds of starch in the region of 1200 to 700cm<sup>-1</sup> and also turgidity is a sign quinon of freshness of vegetables and fruits. The application of various concentrations of natural coater to *Capsicum annuum* significantly improves the turgidity and water content of vegetables. This will helps to maintain the freshness and shelf life of *Capsicum annuum*. The further deterioration of the fruit during the storage of postharvest period of *Capsicum annuum* is useful in the improvement of the shelf-life and freshness of the vegetables during the course of marketing. Thus the application of *Spathodea campanulata* mucilage coating is beneficial for the pos-tharvest of the *Capsicum annuum* in future.

**Keywords:** Post Harvest Physiology, Osmotic Potential, Relative water content, Succulence, FTIR analysis

### Introduction

The applications of edible coating to various fleshy fruits extend the shelf-life and protect them from various environmental effects. Thus the edible coating improves the food quality and extend the shelf-life of fresh produce (Atik *et al.*, 2007). The application of natural polymers as a coating to fruits and vegetables improve structural integrity and prevent the moisture, loss oxidative reactions. When mucilage's come in contact with a surface, they are covered with a coating that soothes the surface that is exposed. The emollient action of mucilage protect the lining of the digestive tract, it indicates that mucilage act as remedy for ulcers, lesions, inflammations in the gastrointestinal tract and inhibits acid secretions. *Spathodea campanulata* P. Beauv. belong to family Bignoniaceae. It is commonly known as fountain tree, pichkari in Marathi. It is semi deciduous tree with a dense, bushy, oral crown. It is a very ornamental tree, the flowers bloom can be seen from great distances. It is widely cultivated in gardens and planted along roadsides. The synthetic polymers such as cellulosic, acrylics, vinyl are used for the film



coating for various types of the pharmaceutical formulations. These synthetic polymers create various ecological and health related problems. Thus the plant based natural polymers with their polysaccharides are ecologically biodegradable, biocompatible and eco-friendly.

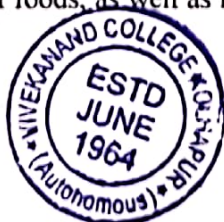
### Material and Method

Coating of raisins was done as 20 ml of absolute alcohol and 2ml rapeseed oil were taken in beaker and keep it on a water bath until it is dissolved. 10 to 20 ml absolute alcohol and dry mucilage powder of flowers of *Spathodea campanulata* were added to it slowly by stirring with a glass rod. 0.1g of potassium meta bi-sulfate, ascorbic acid, benzoic acid a different beakers were dissolved in the 10ml of absolute alcohol and slowly added all above solutions in a corn zein solution, cooled to room temperature and *Capsicum annum* were mixed in 500ml of beaker with coating solution slow shaking and dried on a blotting paper for half an hour. The coated *Capsicum annum* (Vegetable) were kept at room temperature and at 10 °C in fridge 1,2,4,8, and 12 days. The absorbance were taken after every 1<sup>st</sup> day, 4<sup>th</sup> day, 8<sup>th</sup> day and 12<sup>th</sup> day and used for calculation of water content, Relative water content, Succulence and Osmotic potential were calculated according to method described by Water content Weatherly (1965), Succulence by (Klug and Ting 1978), Relative water content (RWC) by Slatyer (1955) and Osmotic potential by Janardhan and Krishnmoorthy (1975). The chemical composition of the synthesized from the mucilaginous plant *Spathodia campanulata*, was studied by using FTIR spectrometer (BRUKER ALPHA 100508 in CFC SHIVAJI UNIVERSITY).

### Result and Discussion

The effect of natural coating of mucilage on post harvest storage of *Capsicum annum* is shown in fig. no 3 to 4 and table no 01 and 02, plate no-01. It is evident from table that the water content, Relative water content, succulence and osmotic potential is significantly increased due to coating of mucilage. It is also noticed that the fresh fruits of *Capsicum annum* coated with mucilage kept in cool condition and room temperature maintainance better turgidity and water relations, than the uncontrolled coated fruits.

Quality cannot be improved after harvest, only maintained; therefore it is important to harvest fruits, vegetables, and flowers at the proper stage and size and at peak quality. The technology of edible coatings has been considered as one of the potential approaches to fulfill this demand. The renewable sources, such as lipids, polysaccharides, and proteins, as edible coating can function as barriers to water vapor, gases, and other solutes and also acts as antimicrobial and antioxidant agents, this results in enhancing quality and extending shelf life of fresh and minimally processed fruits and vegetables (Linn and Zheo, 2007). Succulence is often seen as an anatomical trait common to plants with a high development of a water storage tissue (Kluge and Ting, 1978), in one or various plant organs. The water content of foodstuffs has significant importance since it affects the physical characteristics, technological processes, microbiological stability, and shelf life of foods, as well as having legal and economic ramifications (Ratti and Mujumdar 1997).





Water is the most abundant component in most fruits and vegetables. Relative water content (RWC) is probably the most appropriate measure of plant water status in terms of the physiological consequence of cellular water deficit. Hence RWC is an appropriate estimate of plant water status in terms of cellular hydration under the possible effect of both leaf water potential and OA.

The natural coater was prepared with the application of mucilage powder along with protein, lipid complexes. This natural coater prepared from *Spathodea campanulata* mucilage improves the water content, Relative water content, Succulence and Osmotic potential of grape and tomato fruits, this will helpful to maintain the turgidity of fruits. Turgidity is a sign quiron of freshness of vegetables and fruits and the application of various concentrations of natural coater to grape and tomato fruit significantly improves the turgidity and water content of fruits. This will helps to maintain the freshness and shelf-life of these fruits. Thus, the application of mucilage as a natural polymers, extracted from the waste flowers, fruits and leaves of these avenue roadside plants would be helpful in maintaining the quality of harvested fruits, as well as it might be helpful to reduces the losses caused during post harvest transport and it will post pone the deterioration of these fruits during storage and transport.

We also noticed the significant bands of starch in the region of 1200 to 700 $\text{cm}^{-1}$ , while the C-H stretching region between 2900 to 3261 $\text{cm}^{-1}$  can also be detected in mucilage of *Spathodea campanulata*.

### Conclusion

Mucilage had good swelling properties and viscosity of such type that is suitable for formulation of gel, jellies, cream and other semisolid drug dosage forms. Also dried mucilage has a good flow properties which is suitable for a direct compression formulation. FTIR a study was indicates groups present, Type of compound and bonds present in mucilage flowers of *Spathodea campanulata*. The natural polymers are cheaper, biodegradable and easily available which will reduce the biocompatibility and biomagnifications of synthetic chemicals. These polymers also increase the period of drug release which will be found beneficial for the drug delivery. Thus the present work will be helpful to know the sources of plant based natural polymers which can be very easily utilized by pharmaceutical, cosmetic, textile and agricultural industries.

### Acknowledgement

The authors are thankful to the Head, Department of Botany, Department of Microbiology and Food Technology, Shivaji University Kolhapur and Vivekanand College Kolhapur (Empowered Autonomous) for providing laboratory and library facilities.

Table No: 1. Effect of *Spathodia campanulata* Mucilage extret on *Capsicum annum* at cold condition.





Treatment EC(mS cm <sup>-1</sup> )	<i>Spathodia campanulata</i>			
	Control	4	8	12
Water content (% of D.W.)	2.211	2.26	2.52	2.93
Relative Water Content (%)	15.22	15.63	15.78	15.93
Succulence	3.91	4.05	4.25	4.52
Osmotic potential	-1.92	-2.1	-2.15	-2.28

Table No: 2. Effect of *Spathodia campanulata* Mulilage extract on *Capsicum annum* at room temperature.

Treatment EC(mS cm <sup>-1</sup> )	<i>Spathodia campanulata</i>			
	Control	4	8	12
Water content (% of D.W.)	0.737	0.752	0.784	0.820
Relative Water Content (%)	13.28	13.42	13.75	14.02
Succulence	1.30	1.48	1.85	2.15
Osmotic potential	-1.88	-1.92	-2.01	-2.25



Fig. no.3. Effect of *Spathodia campanulata* Mucilage extract on Post harvest shelf life of *Capsicum annum* stored in Cold condition.

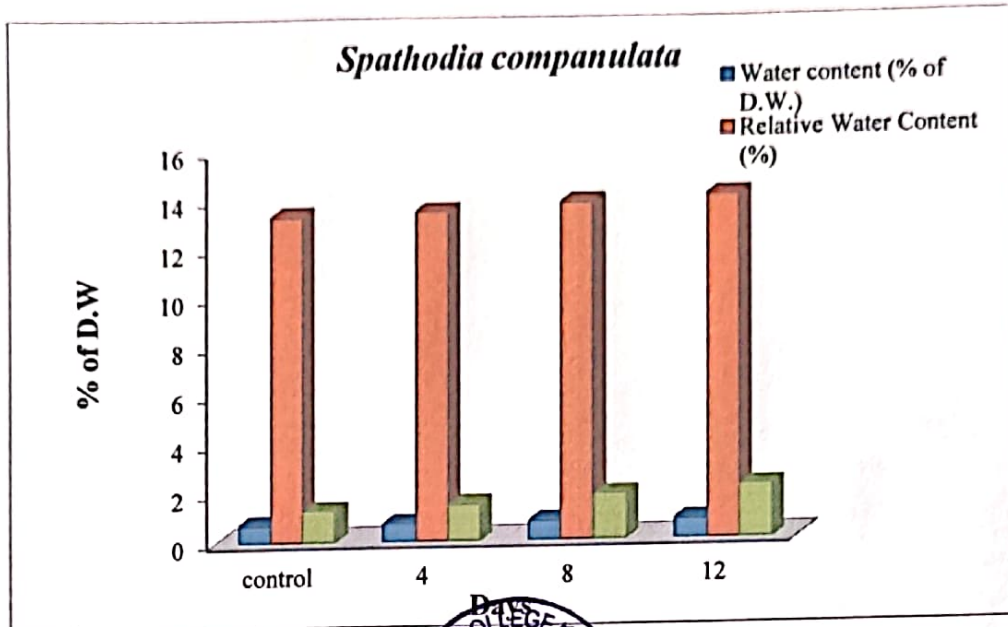


Fig. no.4. Effect of *Spathodia campanulata* Mucilage extract on Post harvest shelf life of *Capsicum annum* stored in normal room temperature.

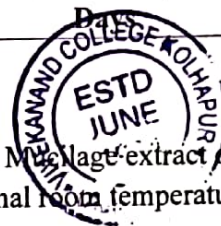
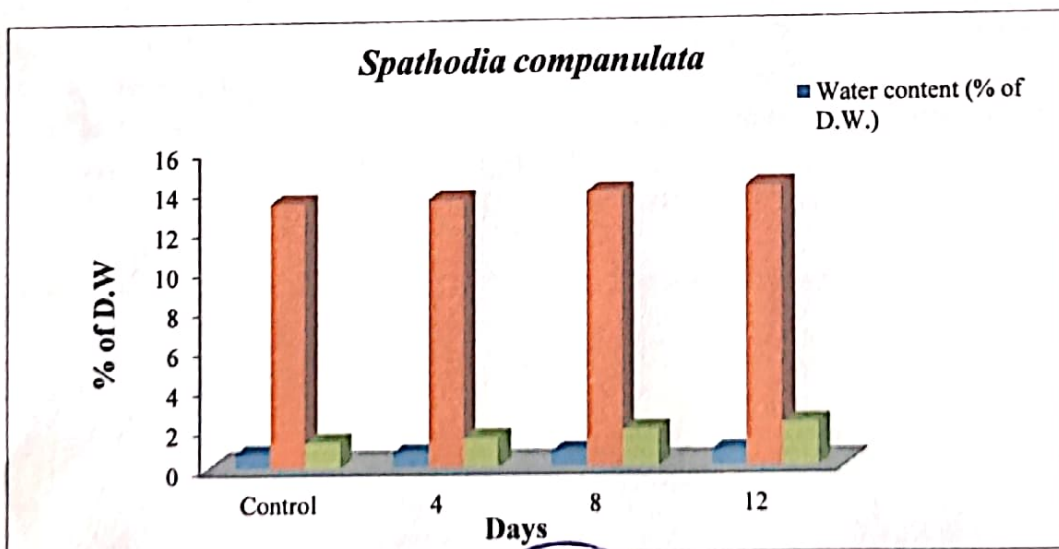
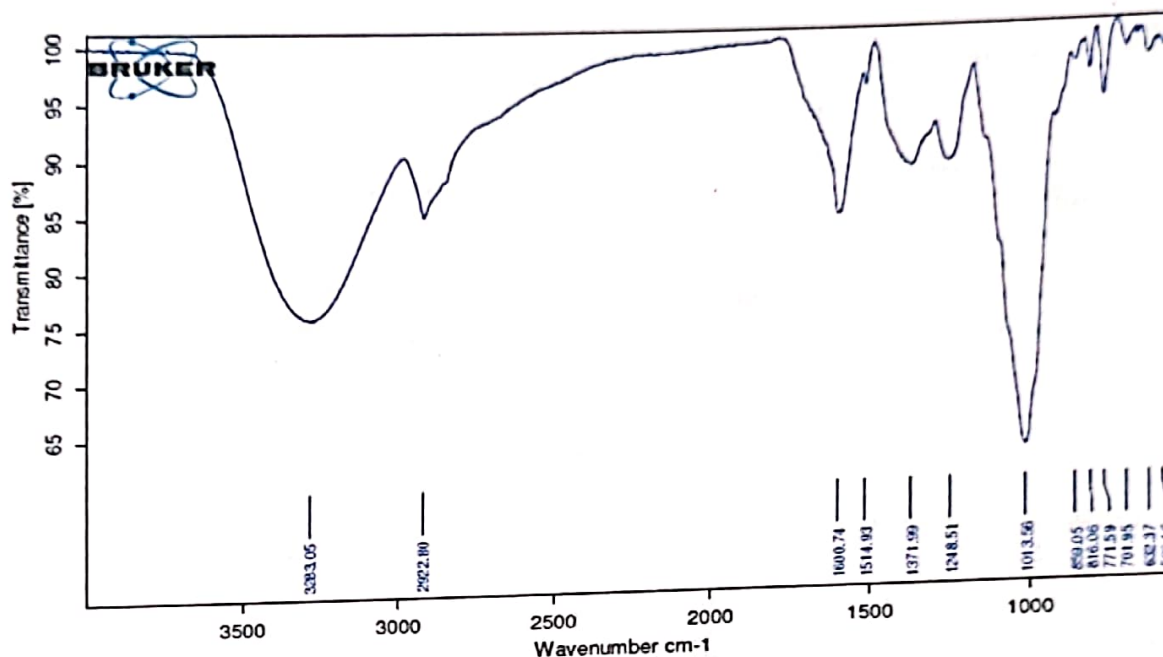




Plate no. 1. FTIR Chromatogram of *Spathodia campanulata*



## References

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