# Feasibility of Fruit Waste-Derived Media for Microbial Culture: A Sustainable and Low-Cost Approach


## ABSTRACT

The present study, conducted at the College of Agriculture, Latur during 2023-2024, explores the viability of using fruit waste-derived media as a cost-effective alternative to conventional media for the growth of plant pathogens. The research focuses on the growth performance of *Pseudomonas fluorescens*, *Fusarium oxysporum* f. sp. *udum*, and *Sclerotium rolfsii* on media prepared from fruit peel of eight fruits (Banana, Pineapple, Papaya, Orange, Guava, Pomegranate, Dragon fruit, and Sapota). These fruit-based media were compared to traditional Nutrient Agar (NA) and Potato Dextrose Agar (PDA). Results revealed that *Sclerotium rolfsii* showed maximum growth on Papaya Dextrose Agar, while *Pseudomonas fluorescens* exhibited the most robust growth on Banana, Papaya and Dragon Fruit Dextrose Agar. *Fusarium oxysporum* f. sp. *udum* demonstrated the highest radial growth on Banana Dextrose Agar. The study also observed that fruit-based media significantly reduced costs compared to Potato Dextrose Agar and Nutrient Agar making them a sustainable and accessible option for microbiological research, particularly in resource-limited environments.



**Keywords**: Fruit peel media, *Pseudomonas fluorescens*, *Fusarium oxysporum* f. sp. *udum*, *Sclerotium rolfsii*, Microbial growth


## INTRODUCTION

In fiscal year 2023, total fruit production reached approximately 107 million metric tons, with major crops including Bananas, mangos, papayas and apples. Despite this large output, nearly 16% of fruits and vegetables are wasted annually due to inadequate cold chain infrastructure. Improper disposal of fruit waste causes significant environmental issues, contributing to air and water pollution.

In the context of microbiological research, traditional culture media such as Potato Dextrose Agar (PDA) and Nutrient Agar (NA) are costly and limit studies in developing countries. These media are essential for supporting microbial growth by providing necessary nutrients. However, the rising cost of ready-made culture media has prompted the search for affordable alternatives.

Fruit waste, particularly peels and pulp, presents a sustainable solution for developing low-cost microbial media. This waste accounts for a significant portion of fruit mass and is often discarded despite its potential as a nutrient source for microbial growth. Prior studies

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have explored the use of alternative substrates such as soy, maize, and rice for culture media, demonstrating comparable microbial growth at a reduced cost. Utilizing fruit waste as a medium for fungal and bacterial cultures could offer a cost-effective and eco-friendly substitute for commercial media, addressing the challenges of research affordability while mitigating fruit waste disposal issues.

This research aims to develop a cost-effective medium using fruit waste for the cultivation of microbial organisms, providing an alternative to expensive traditional media. By doing so, it contributes to the dual objectives of waste reduction and sustainable scientific practices.

## Materials and Method

### Fruits and fruit part used

Following eight different fruits were collected from the local market of Latur. This fruit were used for preparation of alternate culture medium and check their feasibility by inoculation of fungi and bacteria was done.

List 1 : List of different fruits collected for the study

| Sr. No | Collected fruits | Scientific name | Fruit part used |
|---|---|---|---|
| 1 | Banana | *Musa paradisiaca* | Peels |
| 2 | Pineapple | *Ananas comosus* | Peels |
| 3 | Papaya | *Carica papaya* | Peels |
| 4 | Orange | *Citrus sinensis* | Peels |
| 5 | Guava | *Psidium guajava L.* | Pericarp |
| 6 | Pomegranate | *Punica granatum* | Peels |
| 7 | Dragon fruit | *Hylocereus undatus* | Peels |
| 8 | Sapota | *Achras sapota* | Peels |

### Culture medium as control

Potato dextrose agar was used as a control media for multiplication and maintenance of the *Sclerotium rolfsii* and *Fusarium oxysporum* f. sp. *udum*.

### Miscellaneous materials

Miscellaneous experimental material *viz.,* Inoculation needle, Cork borer, Forceps, Spirit lamp, Labels and Scales *etc.* was obtained from the Department of Plant Pathology, College of Agriculture, Latur.

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## METHODS

The method for this study for qualitative analysis of growth of fungi and bacteria in fruit media. This study was based on culture method.

### Fruit medium contains

Eight different fruits were used to prepared medium at three concentrations. Each @ 150 g, 200 g and 250 g weight of fresh fruit pulp or peels was used for preparation of 1000 ml media. Potato Dextrose Agar and Nutrient Agar serve as control media for *Fusarium oxysporum* f. sp. *udum.*, *Sclerotium rolfsii* and *Pseudomonas fluorescence.*

### Preparation of culture media using fruits

Fresh Banana, Pomegranate, Sapota, Dragon Fruit, Papaya, Pineapple, Orange was properly washed with clean water and cut into thin uniform pieces prepared by direct boiling of fruit pulp / peels in distilled water at different weight.

Media was prepared by adding different weights of fruit pulp or peels then they were mixed well by stirring and heating in hotplate stirrer till the solution became homogenous. Adding dextrose and agar-agar at specific concentration. The media was transferred to 250 ml capacity conical flasks and plugged with non-absorbent cotton and sterilized in an autoclave at 121 $^0$C for 15 minutes under the pressure of 15 lbs / inch$^2$. The conical flasks were taken out and 20 ml of sterilized cooled molten media was poured into sterile Petri dishes separately. Media solidification time was noted for each concentration of each test powder. The procedure was repeated thrice for three different concentrations. Potato Dextrose Agar and Nutrient Agar medium which was set as control. The general procedure of media preparation and sterilization as described by Aneza (2003) was followed.

### Microbial inoculation

### Bacteria

The young cultures of tested bacteria *Pseudomonas fluorescence* were taken. Serial dilution was done according to the standard method to get a final bacterial inoculum concentration of $1.0 \times 10^6$ cell / ml. 1 ml bacterial suspension was taken using a sterile pipette. It was inoculated on to the media under sterile conditions and was spread uniformly by a sterile glass spreader. The tested bacteria were also introduced on Nutrient Agar media which served as control. Then all the plates were incubated at 37$^0$C for 48 hours. After the incubation all the plates was observed for bacterial growth and the number of colonies was counted in the plates.

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**Fungi**

Actively growing pure culture of test fungi such as *Sclerotium rolfsii* and *Fusarium oxysporum* f. sp. *udum* were taken. Then a fungal disc was cut by using 5 mm sterile cork borer and placed on the surface of each alternative nutrient culture media in replicates. The tested fungi were also introduced on Potato Dextrose Agar media which served as control. Then all the plates were incubated at room temperature for 2-3 days. After incubation diameter of fungal mycelia was measured by using a measuring scale and other growth characteristics were observed.

**Experimental details: For fresh fruit peels**

Design : CRD (Completely Randomized Design)

Replications: Three

Treatments : Nine

**List 2: Treatments details (Fresh fruit peel medium for *Pseudomonas fluorescence, Fusarium oxysporum* f. sp. *udum* and *Sclerotium rolfsii.)***

| Tr. No. | Treatments | Tr. No. | Treatments |
|---|---|---|---|
| $T_1$ | Banana Dextrose Agar | $T_6$ | Pomegranate Dextrose Agar |
| $T_2$ | Pineapple Dextrose Agar | $T_7$ | Dragon fruit Dextrose Agar |
| $T_3$ | Papaya Dextrose Agar | $T_8$ | Sapota Dextrose Agar |
| $T_4$ | Orange Dextrose Agar | $T_9$ | Nutrient Agar/Potato Dextrose Agar |
| $T_5$ | Guava Dextrose Agar | | |

Observations on bacterial growth / number of colonies formed by the *Pseudomonas fluorescence* and Pigmentation were recorded at an interval of 48 hrs of incubation and be continued up to 7 days.

Radial mycelial growth / colony diameter (mm) was recorded at regular interval and be continued up to 7 days after incubation or till the control Potato Dextrose Agar plates covered fully with mycelial growth of the *Fusarium oxysporum* f. sp. *udum* and *Sclerotium rolfsii.*

**RESULT AND DISCUSSION**

**Table 1. Feasibility of fruits for preparation of media with their colour appearance**

| Sr. No. | Fruits | Feasibility | Colour of media |
|---|---|---|---|
| **1** | Banana | Feasible | Light brown |
| **2** | Pineapple | Feasible | Light yellow |
| **3** | Papaya | Feasible | Reddish yellow |

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| | | | |
|---|---|---|---|
| **4** | Orange | Feasible | Light yellow |
| **5** | Guava | Feasible | Brown |
| **6** | Pomegranate | Feasible | Yellow |
| **7** | Dragon | Feasible | Dark red |
| **8** | Sapota | Feasible | Brown |

Feasibility of fruits was checked by studying different parameters such as solidification time, inoculation of fungi and bacteria and by making powder of fruit peels.

All used fruits were feasible to make culture media. The colour of fruit culture media *viz.*, Light brown (Banana Dextrose Agar), Light yellow (Pineapple Dextrose Agar and Orange Dextrose Agar), Reddish yellow (Papaya Dextrose Agar), Brown (Guava Dextrose Agar and Sapota Dextrose Agar), Yellow (Pomegranate Dextrose Agar) and Dark red (Dragon fruit Dextrose Agar).

**Table 2. Determination of solidification time for fruit-based media**

| Sr. No. | Fruits media | Quantity of media | Quantity of Agar-Agar | Time | Status |
|---|---|---|---|---|---|
| **1** | Banana Dextrose Agar | 25g peels +100 ml $H_2O$ | 2.0 g | 20 min | Solidified |
| **2** | Pineapple Dextrose Agar | 25g peels +100 ml $H_2O$ | 2.0 g | 30 min | Solidified |
| **3** | Papaya Dextrose Agar | 25g peels +100 ml $H_2O$ | 2.0 g | 20 min | Solidified |
| **4** | Orange Dextrose Agar | 25g peels +100 ml $H_2O$ | 3.0 g | 30 min | Solidified |
| **5** | Guava Dextrose Agar | 25g peels +100 ml $H_2O$ | 3.0 g | 40 min | Solidified |
| **6** | Pomegranate Dextrose Agar | 25g peels +100 ml $H_2O$ | 3.5 g | 40 min | Solidified |
| **7** | Dragon fruit Dextrose Agar | 25g peels +100 ml $H_2O$ | 2.5 g | 20 min | Solidified |
| **8** | Sapota Dextrose Agar | 25g peels +100 ml $H_2O$ | 2.5 g | 20 min | Solidified |

The result (Table 2) showed that different fruit peel media required different concentration of Agar-agar for solidification of 25 g fresh fruit peel / 100 ml of culture media *i.e.* Banana Dextrose Agar, Pineapple Dextrose Agar and Papaya Dextrose Agar required 2 g of Agar-agar and solidified in 20 min, 30 min and 20 min; respectively. Orange Dextrose Agar and Guava Dextrose Agar required 3 g of Agar-agar each and those media solidified in 30 min and 40 min; respectively.

Dragon fruit Dextrose Agar and Sapota Dextrose Agar required 2.5 g of Agar-agar each for solidified in 20 min. Pomegranate Dextrose Agar required highest quantity of Agar-Agar among the all other fruit media *i.e.* 3.5 g and required time for solidification was 40 min.

**Table 3: Effect of different fresh fruit peel culture media on formation of colonies of *Pseudomonas fluorescence* (@ 150 g, 200 g, 250 g fresh fruit peel / 1000 ml water)**

| Tr. No. | Culture media | No. of Colonies of *Pseudomonas spp.* (CFU / ml) |
|---|---|---|

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| | (Fresh peel) | Concentration @ 150 g / 1000 ml | Concentration @ 200 g / 1000 ml | Concentration @ 250 g / 1000 ml |
|---|---|---|---|---|
| $T_1$ | Banana Dextrose Agar | Confluent Growth (abundant, enormous and uncountable colonies) | | |
| $T_2$ | Pineapple Dextrose Agar | | | |
| $T_3$ | Papaya Dextrose Agar | | | |
| $T_4$ | Orange Dextrose Agar | | | |
| $T_5$ | Guava Dextrose Agar | No Colonies | | |
| $T_6$ | Pomegranate Dextrose Agar | No Colonies | | |
| $T_7$ | Dragon fruit Dextrose Agar | $7.6 \times 10^7$ | $9 \times 10^7$ | Confluent Growth |
| $T_8$ | Sapota Dextrose Agar | $25 \times 10^7$ | $22.8 \times 10^7$ | |
| $T_9$ | Nutrient Agar (Control) | Confluent Growth | | |

**CFU comparison of *Pseudomonas fluorescence.*, on different fresh fruit peel media.**

The results (Table 3) revealed that, on the Banana Dextrose Agar, Pineapple Dextrose Agar, Papaya Dextrose Agar, Orange Dextrose Agar and Nutrient Agar, the colonies of *Pseudomonas fluorescence* were abundant, enormous and confluent growth in all used concentrations. Except in case of Dragon fruit Dextrose Agar, the countable colonies were found $7.6 \times 10^7$ CFU / ml and $9 \times 10^7$ CFU / ml; at concentration of 150 g and 200 g fresh peel / 1000 ml; respectively and in case of Sapota Dextrose Agar $25 \times 10^7$ CFU / ml and $22.8 \times 10^7$ CFU / ml; respectively. Dragon fruit as well as Sapota Dextrose Agar showed abundant and Confluent Growth of *Pseudomonas fluorescence.* at concentrations of 250 g fresh peel / 1000 ml.

On the Guava Dextrose Agar and Pomegranate Dextrose Agar no colonies were formed in all respective concentrations. Comparing with the Nutrient Agar the Orange Dextrose Agar support better growth of *Pseudomonas fluorescence.*

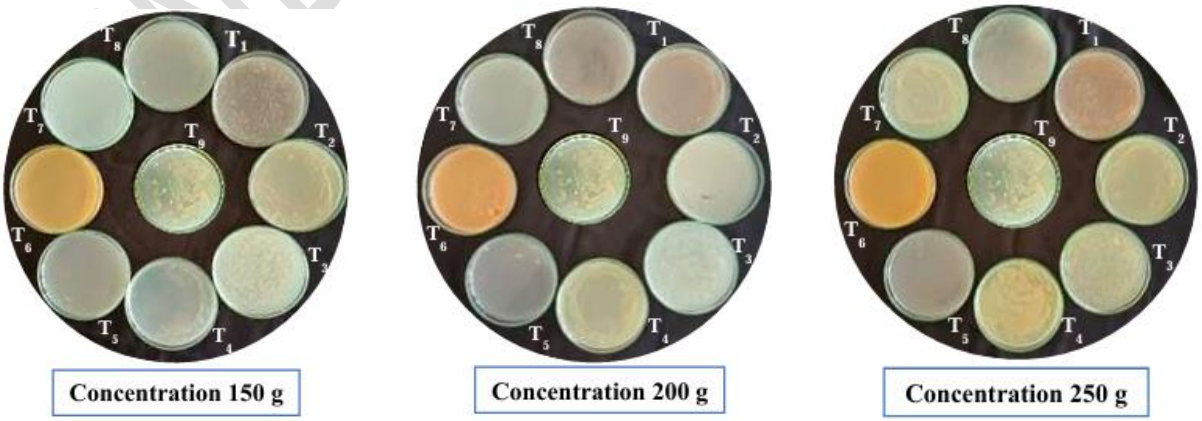


**Plate 1: CFU comparison of Pseudomonas fluorescence., on different fresh fruit peel media.**

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**Table 4: Effect of different Fruit culture media on the radial mycelium growth of *Fusarium oxysporum* f. sp. *udum*., (@ 250 g fresh peel / 1000 ml water)**

| Tr. No. | Culture media (Fresh peels) | Radial mycelium growth 3 DAI in mm | Radial mycelium growth 3 DAI in percent | Radial mycelium growth 7 DAI in mm | Radial mycelium growth 7 DAI in percent | Radial mycelium growth 10 DAI in mm | Radial mycelium growth 10 DAI in percent | Mean colony Diameter in mm* | Average Growth in Percent |
|---|---|---|---|---|---|---|---|---|---|
| **$T_1$** | Banana Dextrose Agar | 77.5 | 86.11 **(68.09)** | 85.5 | 95.00 **(77.22)** | 90.0 | 100 **(90.0)** | 84.33 | 93.70 **(75.65)** |
| **$T_2$** | Pineapple Dextrose Agar | 73.5 | 81.66 **(64.63)** | 88.5 | 95.00 **(77.47)** | 90.0 | 100 **(90.0)** | 84.00 | 93.33 **(75.11)** |
| **$T_3$** | Papaya Dextrose Agar | 65.0 | 72.22 **(58.18)** | 89.0 | 98.88 **(84.48)** | 90.0 | 100 **(90.0)** | 81.33 | 90.36 **(71.92)** |
| **$T_4$** | Orange Dextrose Agar | 33.0 | 36.66 **(37.24)** | 47.5 | 52.77 **(46.57)** | 80.0 | 88.88 **(70.51)** | 53.50 | 59.44 **(50.43)** |
| **$T_5$** | Guava Dextrose Agar | 63.0 | 70.00 **(56.76)** | 80.0 | 80.88 **(64.08)** | 87.0 | 96.66 **(79.51)** | 76.66 | 85.17 **(67.48)** |
| **$T_6$** | Pomegranate Dextrose Agar | 26.0 | 28.88 **(32.49)** | 40.0 | 44.44 **(41.78)** | 88.5 | 98.33 **(82.79)** | 51.50 | 57.22 **(49.13)** |
| **$T_7$** | Dragon fruit Dextrose Agar | 61.0 | 67.77 **(55.38)** | 82.0 | 91.11 **(72.69)** | 87.5 | 97.22 **(80.87)** | 76.83 | 85.36 **(67.48)** |
| **$T_8$** | Sapota Dextrose Agar | 88.0 | 97.77 **(81.53)** | 90.0 | 100 **(90.00)** | 90.0 | 100 **(90.0)** | 89.33 | 99.25 **(81.03)** |
| **$T_9$** | Potato Dextrose Agar | 75.5 | 83.88 **(66.32)** | 87.0 | 96.66 **(79.78)** | 90.0 | 100 **(90.0)** | 84.16 | 93.51 **(75.39)** |
| | **S.E.(m) ±** | | **0.83 (0.69)** | | **1.20 (1.46)** | | **0.55 (0.95)** | | **1.19 (1.13)** |
| | **C.D. (P=0.01)** | | **2.50 (2.06)** | | **3.59 (4.38)** | | **1.65 (2.85)** | | **3.56 (3.40)** |

*Mean of 3rd,7th and 10th days growth of radial mycelium
Figures in parentheses are arcsine transformed values

The result (Table 4) revealed that, radial mycelium growth of *Fusarium oxysporum*, 3 days after inoculation was highest on the Sapota Dextrose Agar (88.00 mm), rather than other fruit culture media. Whereas, it was lowest on Pomegranate Dextrose Agar media (26.00 mm).

With respect to the percentage growth of *Fusarium oxysporum,* 3 days after inoculation the result were indicated that, the radial mycelium growth on Sapota Dextrose Agar (88.88 %) were significantly superior over other fruit culture media and Potato Dextrose agar (83.88 %). On the 7th day, the radial mycelium growth of *Fusarium oxysporum*, was highest on the Sapota Dextrose Agar (90 mm), rather than other fruit culture media and Potato Dextrose Agar (87.00 mm). Whereas, it was lowest on Pomegranate Dextrose Agar media (40 mm).

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With respect to the percentage growth of *Fusarium oxysporum*, 7 days after inoculation the result were indicated that, the radial mycelium growth on Sapota Dextrose Agar (100.0 %) were significantly superior over other culture media. Percent growth on Papaya Dextrose Agar showed (98.88 %) were significantly superior over Potato Dextrose Agar (96.66 %). The Banana Dextrose Agar (95.00 %) and Pineapple Dextrose Agar (95.00 %) at par with Potato Dextrose Agar.

On the 10$^{th}$ day, the radial mycelium growth of *Fusarium oxysporum*, on Banana Dextrose Agar, Pineapple Dextrose Agar, Papaya Dextrose Agar, Sapota Dextrose Agar and control Potato Dextrose Agar showed 90.00 mm (100.00 %) were at par each other. Whereas, it was lowest on Orange Dextrose Agar media (75.00 mm).

If considering the mean colony growth of *Fusarium oxysporum,* the result was indicated that, the radial mycelium growth highest on Sapota Dextrose Agar (89.33 mm) rather than other culture media. Whereas, it was lowest on Pomegranate Dextrose Agar media (51.50 mm).

While considering average growth in percent of *Fusarium oxysporum,* indicated that Sapota Dextrose Agar (99.25 %) significantly superior over other culture media. Whereas, Banana Dextrose Agar (93.70 %) and Pineapple Dextrose Agar (93.33 %) were at par with Potato Dextrose Agar (93.51 %).

The data suggest that Sapota Dextrose Agar, was most conducive to the growth of *Fusarium oxysporum* followed closely by Banana Dextrose Agar as well as Papaya, Pineapple Dextrose Agar also supported significant fungal growth, indicated their potential as alternative culture media.


**Plate 2: Effect of different Fruit culture media on the radial mycelium growth of *Fusarium oxysporum* f. sp. *udum.*, on 3DAI, 7DAI and 10DAI.**

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**Table 5. Effect of different Fruit culture media on the radial mycelium growth of *Sclerotium rolfsii.*, (@ 250 g fresh peel / 1000 ml water)**

| Tr. No. | Culture media (Fresh peels) | Radial mycelium growth 3 DAI in mm | Radial mycelium growth 3 DAI in percent | Radial mycelium growth 7 DAI in mm | Radial mycelium growth 7 DAI in percent | Radial mycelium growth 10 DAI in mm | Radial mycelium growth 10 DAI in percent | Mean colony Diameter in mm* | Average Growth in Percent |
|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | Banana Dextrose Agar | 80.0 | 88.88 **(70.56)** | 90.0 | 100 **(90.0)** | 90.0 | 100 **(90.0)** | 86.66 | 96.28 **(78.85)** |
| $T_2$ | Pineapple Dextrose Agar | 41.0 | 45.55 **(42.43)** | 90.0 | 100 **(90.0)** | 90.0 | 100 **(90.0)** | 73.66 | 81.84 **(64.75)** |
| $T_3$ | Papaya Dextrose Agar | 46.0 | 51.11 **(45.61)** | 90.0 | 100 **(90.0)** | 90.0 | 100 **(90.0)** | 75.33 | 83.70 **(66.16)** |
| $T_4$ | Orange Dextrose Agar | 40.0 | 44.44 **(41.78)** | 65.0 | 72.22 **(58.16)** | 90.0 | 100 **(90.0)** | 65.00 | 72.22 **(58.17)** |
| $T_5$ | Guava Dextrose Agar | 43.0 | 47.77 **(43.70)** | 77.0 | 85.55 **(67.64)** | 90.0 | 100 **(90.0)** | 70.00 | 77.77 **(61.86)** |
| $T_6$ | Pomegranate Dextrose Agar | 56.0 | 62.22 **(52.05)** | 80.0 | 88.88 **(70.53)** | 90.0 | 100 **(90.0)** | 75.33 | 83.70 **(66.17)** |
| $T_7$ | Dragon fruit Dextrose Agar | 50.0 | 55.55 **(48.16)** | 90.0 | 100 **(90.0)** | 90.0 | 100 **(90.0)** | 76.66 | 85.17 **(63.35)** |
| $T_8$ | Sapota Dextrose Agar | 54.0 | 60.00 **(50.74)** | 80.0 | 88.88 **(70.50)** | 90.0 | 100 **(90.0)** | 74.66 | 82.95 **(65.59)** |
| $T_9$ | Potato Dextrose Agar | 34.0 | 37.77 **(37.90)** | 80.0 | 88.88 **(70.51)** | 90.0 | 100 **(90.0)** | 68.00 | 75.55 **(60.34)** |
| | **S.E.(m) ±** | | **0.75 (0.55)** | | **0.71 (0.64)** | | **N/A** | | **0.75 (0.54)** |
| | **C.D. (P=0.01)** | | **2.27 (1.66)** | | **2.14 (1.92)** | | | | **2.25 (1.64)** |

*Mean of 3rd,7th and 10th days growth of radial mycelium
Figures in parentheses are arcsine transformed values

The result (Table 5) revealed that, radial mycelium growth of *Sclerotium rolfsii*, 3 days after inoculation was the highest on Banana Dextrose Agar (80.00 mm), rather than other fruit culture media and Potato Dextrose Agar. Whereas it was lowest in case of Orange Dextrose Agar (40.00 mm).

With respect to the percentage growth of *Sclerotium rolfsii,* 3 days after inoculation the result were indicated that, the radial mycelium growth on Banana Dextrose Agar (88.88 %) were significantly superior over other fruit culture media and Potato Dextrose agar (37.77 %).

On the 7th days after inoculation, the radial mycelium growth of *Sclerotium rolfsii* was highest on Banana Dextrose Agar, Pineapple Dextrose Agar, Papaya Dextrose Agar and Dragon

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fruit Dextrose Agar showed (90.00 mm) were at par each other. Whereas the lowest radial mycelium growth on Orange Dextrose Agar (65.00 mm).

With respect to the percentage growth of *Sclerotium rolfsii,* 7 days after inoculation the result were indicated that, the radial mycelium growth on Banana Dextrose Agar, Pineapple Dextrose Agar, Papaya Dextrose Agar and Dragon fruit Dextrose Agar showed (100.0 %) were at par each other and significantly superior over Potato Dextrose Agar (88.88 %). Whereas Sapota Dextrose Agar (88.88 %) and Potato Dextrose Agar at par each other.

On the 10$^{th}$ days after inoculation, the radial mycelium growth of *Sclerotium rolfsii*, indicated that all the fruit culture media as well as Potato Dextrose Agar were showed the maximum growth *i.e*. 90.00 mm (100 %). It revealed that all the treatments were effective and at par each other.

If considering the mean colony growth of *Sclerotium rolfsii*, result was indicated that, the radial mycelium growth highest on Banana Dextrose Agar (86.66 mm) rather than other culture media. Whereas, it was lowest on Orange Dextrose Agar media (65.00 mm). While considering average growth in percent of *Sclerotium rolfsii*., indicated that Banana Dextrose Agar (96.28 %) were significantly superior over other fruit culture media as well as Potato Dextrose Agar (75.55 %). Whereas, all fruit media was significantly superior over Potato Dextrose Agar. Except Orange Dextrose Agar (72.22 %), at which lowest growth of *Sclerotium rolfsii* was observed.


**Plate 3: Effect of different Fruit culture media on the radial mycelium growth of *Sclerotium rolfsii.,* on 3 DAI, 7 DAI and 10 DAI.**

## SUMMARY AND CONCLUSION

This study explores the feasibility and effectiveness of using fruit waste as culture media for microbial growth, comparing fresh fruit peel media with dehydrated fruit powder media across three different concentrations. Conducted at the College of Agriculture, Latur,

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the research focused on preparing media from the peels of Banana, Pineapple, Papaya, Orange, Guava, Pomegranate, Dragon Fruit and Sapota, aiming to find viable and cost-effective alternatives to traditional media such as Potato Dextrose Agar (PDA) and Nutrient Agar (NA).

The primary objective was to evaluate the performance of these fruit-based media in cultivating *Pseudomonas fluorescens*, *Fusarium oxysporum* f. sp. *udum* and *Sclerotium rolfsii*. The media were tested at concentrations of 150 g, 200 g and 250 g fresh fruit peel per 1000 ml of water, focusing on their ability to support microbial and fungal growth compared to conventional media. The results revealed significant variations in growth performance depending on the type of media and concentration used.

For *Pseudomonas fluorescens* particularly Banana Dextrose Agar and Orange Dextrose Agar, consistently supported robust and confluent microbial growth in fresh fruit peel media showed variable results, with some peels less effective in supporting microbial growth. At all tested concentrations.

When evaluating the growth of *Fusarium oxysporum* f. sp. *udum*, effectiveness of Banana Dextrose Agar compared to traditional PDA highlights its potential as a reliable alternative for fungal cultivation.

The cost analysis revealed that fruit powder media were significantly more economical than traditional media, with substantial savings observed, especially with Banana and Pineapple Dextrose Agars.

In conclusion, this study demonstrates that fruit waste, in the form of fresh peels can serve as effective culture media for microbial and fungal growth. The findings underscore the potential of utilizing fruit waste in sustainable and resource-efficient research practices, providing a promising avenue for further exploration and optimization in microbiological and agricultural applications.

This thesis explored the potential of utilizing both fresh fruit peels as alternative culture media for microbial and fungal growth, compared to traditional media such as Potato Dextrose Agar (PDA) and Nutrient Agar (NA). The findings provide valuable insights into the feasibility, effectiveness and cost-efficiency of using fruit-based media in microbiological and fungal research.

**1. Feasibility and Effectiveness**

The research demonstrated that both fresh fruit peels can serve as viable alternatives to traditional culture media. Fresh fruit peel media, including those prepared from Banana and Papaya peels, showed promising results in supporting microbial and fungal growth, although

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their effectiveness varied depending on the type of fruit and concentration used. Among the fruit-based media tested, Banana and Orange-based media emerged as particularly effective, providing growth conditions comparable to or better than traditional media.

**2. Cost-Efficiency and Sustainability**

Using fruit waste, both in the form of fresh peel, presents significant advantages in terms of cost reduction and sustainability. Fruit-based media are notably less expensive than commercially available media like PDA and NA. This cost-effectiveness is particularly beneficial in resource-limited settings and aligns with sustainability goals by promoting the use of agricultural by-products.

**3. Practical Applications and Recommendations**

The findings suggest that fruit-based media, especially those derived from Banana and Papaya, can be effectively employed in microbiological and fungal culture applications. These media offer a practical solution for reducing research costs and supporting sustainable practices. However, the variability observed in fresh fruit peel media highlights the need for further optimization. Standardizing preparation methods and concentrations will be crucial for improving the reliability and reproducibility of results. Future research should focus on refining the formulations and investigating the nutrient profiles of different fruit-based media to enhance their effectiveness and applicability.

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3. Incorporated

## References


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