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Original Research Paper

Environmental Science

IDENTIFICATION OF WASTE UTILIZING BACTERIA FROM FRUIT WASTE

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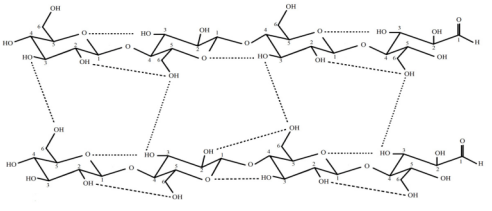
ABSTRACT

Various types of waste are generated everyday in extensive quantities, generating a significant problem in its management and disposal. Many methods could achieve sustainable development, methods that could not only improve waste management but could also lead to the production of industrially important chemicals, materials, and fuels. Valorization of waste is a process that involves conversion of waste materials into more useful products like chemicals, materials, and fuels. Food waste valorization is one of the current research areas as an alternative to the disposal of a wide range of organic waste using microorganisms as one of the strategies. Bacterial cellulose is produced by several species of *Acetobacter* and because of its unique properties; it has advantages over plant cellulose. Today, this biopolymer has numerous applications at many industrial fields. In this study, isolates of biocellulose (BC)-producing strains were isolated from fruit waste and coconut husk. The isolates were selected from each of the source (fruit waste and coconut husk). Then fruit waste and coconut husk were screened for the identification of potential bacterialIntroduction

KEYWORDS : Valorization, fruit waste.

Introduction: Waste of different types (e.g., agricultural, food, industrial) is generated day by day in extensive quantities, generating a significant problem in its management and disposal. A widespread feeling of "environment in danger" has been present everywhere in our society in recent years, which, however, has not yet crystallized in a general concienciation of cutting waste production in our daily lives. Many methods could achieve sustainable development, methods that could not only improve waste management but could also lead to the production of industrially important chemicals, materials, and fuels, in essence, valuable end products.

Around 1.3 billion ton of food is wasted in the world, implying one third of the food produced globally for human consumption is wasted every year .Selected food waste residues are used for the extraction or production of value added products (e.g. whey protein isolates, essential oils, bioplastic). Food waste valorization is one of the current research areas as a potential alternative to the disposal of a wide range of organic waste using microorganisms as one of the strategies. Microbial valorization for production of chemicals and materials from renewable resources is a potential food waste valorization technique. Among microbial valorization products, bacterial cellulose (BC) has been best known due to its low cost, environmentally friendly nature, renewability, nanoscale dimensions, biocompatibility, and extremely high hydrophilicity..



Inter- and intra-hydrogen bonding of bacterial cellulose

Bacterial cellulose has been used as traditional popular desert "nata de coco" in Philippines and "Kombucha tea" as dietary drink. Bacterial cellulose also used as a coating, binding, thickening and emulsifying agent in food industries [12, 13]. Keeping in view of the above, the present work was undertaken to isolate and characterize the efficient cellulose producing bacteria from different sources.

Materials and Methods

The study was divided into four phases :

1. In the first phase, fruit waste was procured from fruit mandi ,Faridabad and coconut husk was obtained from the local vendor at Faridabad.
2. Second phase – Innoculation of waste in HS broth is done in duplicates and incubated at (30° C for 7 days) .
3. Third phase - Culture broth with maximum pellicle formation was serially diluted in NaCl solution upto five dilutions and inoculated on HS media. Then, incubated at (30° C for 2 days) .
4. Fourth phase - Morphological and biochemical testing.

Dilution of samples prepared from fruit waste HS broth (maximum pellicle formation):

Sample no.	Source	Isolate Code	Concentration
1	Fruit waste	F1	10^{-1}
2		F2	10^{-2}
3		F3	10^{-3}
4		F4	10^{-4}
5		F5	10^{-5}

Concentration of samples prepared from coconut husk HS broth (maximum pellicle formation):

Sample no.	Source	Isolate Code	Concentration
1	Coconut Husk	C1	10^{-1}
2		C2	10^{-2}
3		C3	10^{-3}
4		C4	10^{-4}
5		C5	10^{-5}

Result and Discussion

Fruit Waste

From serially diluted samples F2 sample showed best formed colonies.

Table 1. Morphological testing for F2:

Characteristics	Observation
Colour	Creamy
Shape	Circular
Elevation	Convex
Surface	Smooth
Margin	Entire
Texture	Smooth
Shape of cell	Rod shaped
Diameter of colony	4 mm

From the above table, we concluded that the colonies formed were creamy in colour, circular shaped, with convex elevation , smooth surface and texture , were rod shaped and 4 mm in diameter.

Biochemical testing – Gram staining, methyl red test, and indole test.

Table 2. Biochemical characterization of F2

Biochemical test	Observation
Methyl Red Test	POSITIVE
Indole Test	NEGATIVE
Gram Staining	NEGATIVE

The table no. 2 shows that a gram negative bacteria was present in F2 sample.

COCONUT HUSK

From serially diluted samples F2 sample showed best formed colonies

Table 3. Morphological testing

Characteristics	Observation
Colour	Creamy
Shape	Circular
Elevation	Convex
Surface	Smooth
Margin	Entire
Texture	Smooth
Shape of cell	Rod shaped
Diameter of colony	5 mm

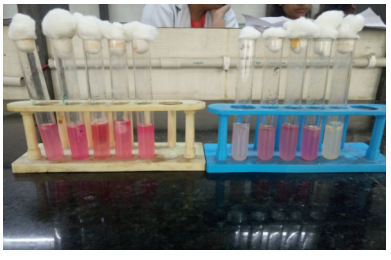
From the above table, we concluded that the colonies formed were creamy in colour, circular shaped, with convex elevation , smooth surface and texture , were rod shaped and 5 mm in diameter.

- Biochemical – Gram staining, methyl red test, and indole test.

Table 4. Biochemical characterization of F2

Biochemical test	Observation
Methyl Red Test	POSITIVE
Indole Test	NEGATIVE
Gram Staining	NEGATIVE

The table no. 4 shows that a gram negative bacteria was present in F2 sample.



Conclusion:

The present study was carried out for the identification of waste utilizing bacteria for value-addition. For this purpose , we did microscopic characterization (colour , elevation , shape etc.) , biochemical testing (indole , methyl red and gram staining) of the grown colonies of bacteria. The results showed that the grown colonies were gram negative in nature which has the potential for cellulose production. Biochemical testing also confirms the presence of potential cellulose producers in the samples. As we all know that cellulose has many applications in industries so it can be used for many purposes. In future studies can be done for the production of value added products from waste materials which will be of low cost and high quality.

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