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MICROORGANISMS ASSOCIATED WITH THE SPOILAGE OF POTATOES

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ABSTRACT

Potato spoilage is a major concern in food storage and post-harvest management because microorganisms rapidly colonize damaged or stored tubers under favourable environmental conditions. The present study was conducted to isolate and observe microorganisms associated with spoiled potato samples using Nutrient Agar (NA) for bacterial growth and Potato Dextrose Agar (PDA) for fungal growth. Spoiled potato tissues were collected aseptically and inoculated onto culture media followed by incubation under laboratory conditions. Distinct bacterial colonies were observed on Nutrient Agar, while extensive fungal growth with different colony morphologies developed on Potato Dextrose Agar. The fungal colonies exhibited white cottony growth along with greenish sporulating regions, indicating the presence of storage fungi commonly associated with food spoilage. The study demonstrates that spoiled potatoes harbour a diverse microbial population capable of causing deterioration, discoloration, odour production, and tissue softening. The findings emphasize the importance of hygienic handling and proper storage conditions to minimize microbial contamination and post-harvest losses.

KEYWORDS

Potato spoilage, Bacteria contamination, Fungal contamination,*Aspergillus*, *Penicillium*, *Rhizopus*, *Pectobacterium* , food poisoning.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most widely consumed vegetable crops in the world and serves as an important source of carbohydrates, vitamins, minerals, and dietary fibre. Due to its high moisture and nutrient content, potato tubers are highly susceptible to microbial spoilage during storage and transportation. Microbial deterioration not only reduces market quality but also results in substantial economic losses.

Several microorganisms including bacteria, moulds, and yeasts are involved in potato spoilage. These microorganisms invade damaged tissues and multiply rapidly under favourable moisture and temperature conditions. According to Pasteur (1861), microorganisms play an important role in decomposition and fermentation processes. Later, De Bary (1886) demonstrated the role of fungi in plant diseases and food spoilage. Soft rot bacteria such as *Pectobacterium* and *Erwinia* species were

extensively studied by Smith (1896), while fungal spoilage organisms including *Aspergillus*, *Penicillium*, and *Rhizopus* were reported by Raper and Thom (1949) in stored food products.

Bacterial spoilage of potatoes commonly causes soft rot characterized by tissue maceration, foul odour, and sliminess. Fungal spoilage is usually associated with discoloration, dry rot, and visible mycelial growth on the tuber surface. Isolation of microorganisms using selective culture media remains one of the fundamental methods for identifying spoilage-associated microbes.

The present investigation was carried out to isolate and observe bacteria and fungi associated with spoiled potato samples using Nutrient Agar (NA) and Potato Dextrose Agar (PDA) media.

MATERIALS AND METHODS

Collection of Sample

Spoiled potato samples showing visible signs of decay were collected from local storage conditions. The infected portions were transferred aseptically into sterile containers for microbiological analysis.

Figure 1: Spoiled potato sample

Preparation of Culture Media

Nutrient Agar (NA) was prepared for bacterial isolation, while Potato Dextrose Agar (PDA) was prepared for fungal isolation according to standard microbiological procedures. The media were sterilized by autoclaving at 121°C for 15 minutes and poured into sterile Petri plates.

Inoculation Procedure

A small portion of spoiled potato tissue was homogenized in sterile distilled water. Using a sterile inoculating loop, the suspension was streaked separately onto Nutrient Agar and Potato Dextrose Agar plates.

Incubation

The inoculated Nutrient Agar plates were incubated at 37°C for 24–48 hours for bacterial growth. PDA plates were incubated at room temperature for 4–7 days to allow fungal growth.

Observation of Colonies

After incubation, colony morphology including colour, texture, shape, elevation, and growth pattern was carefully observed and recorded

Figure 2: Fungi moulds on Potato Dextrose Agar

Figure 3: Bacterial colonies on Nutrient Agar

RESULTS

Table 1. Summary of Microbial Growth Observed

Culture medium	**Targeted microorganisms**	**Observation**	**Interpretation**
Nutrient Agar(NA)	Bacteria	Circular creamy-white colonies with smooth and irregular margins	Mixed bacterial contamination
Potato Dextrose Agar(PDA)	Fungi	Dense white cottony growth with greenish-yellow sporulating regions	Mixed fungal contamination
NA Control	Bacteria	No growth	Aseptic conditions maintained
PDA Control	Fungi	No growth	Reliable procedure

Table 2. Probable Microorganisms Associated with Potato Spoilage

Group	Probable genera mentioned
Bacteria	*Pectobacterium, Bacillus, Pseudomonas, Erwinia*
Fungi	*Aspergillus, Penicillium, Rhizopus*

Table 3. Spoilage Characteristics

Microbial group	Major Effect on Potato
Bacteria	Soft rot, tissue maceration, foul odour, sliminess
Fungi	Dry rot, discoloration, visible mycelial growth
Both	Reduced shelf life and quality deterioration

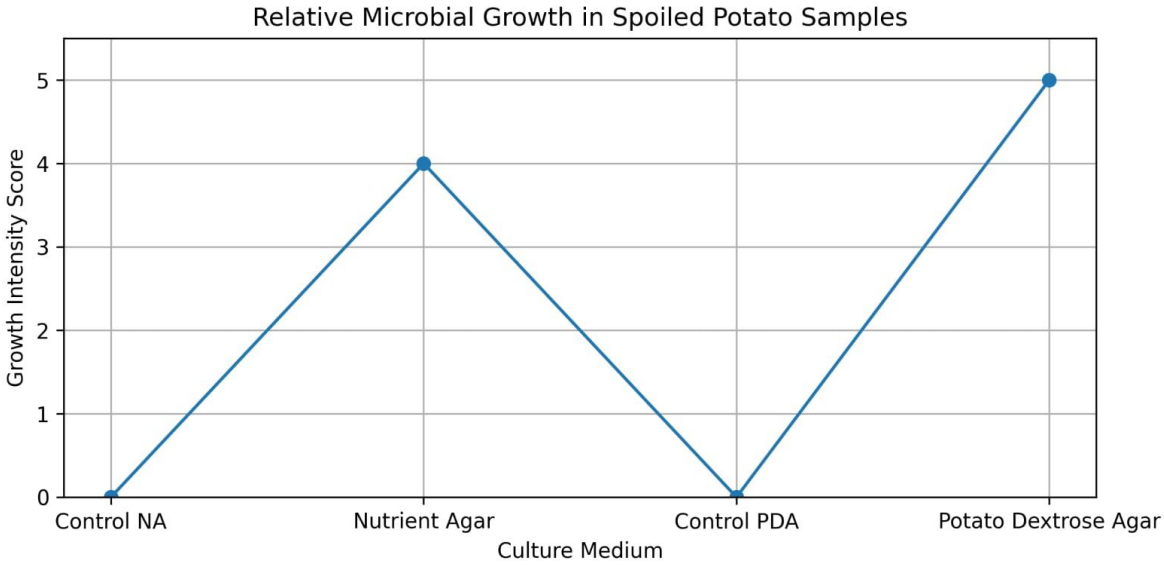

Figure 4 : Relative Microbial Growth in Spoiled Potato Samples

DISCUSSION

Bacterial Growth on Nutrient Agar

Distinct bacterial colonies were observed on the Nutrient Agar plate inoculated with spoiled potato extract. Colonies appeared circular, creamy white, and varied in size. Some colonies showed smooth margins while others exhibited irregular growth. The presence of multiple colony types indicated mixed bacterial contamination associated with potato spoilage.

The bacterial growth suggests the involvement of soft rot and decomposing bacteria capable of utilizing potato nutrients for rapid multiplication. The control plate showed negligible or no microbial growth, confirming aseptic experimental conditions.

Fungal Growth on Potato Dextrose Agar

Profuse fungal growth was observed on Potato Dextrose Agar after incubation. Dense white cottony mycelial colonies covered a major portion of the plate. Greenish-yellow sporulating regions were also noticed at the center of some colonies, indicating active fungal sporulation.

Different fungal colony morphologies suggested the presence of mixed fungal flora associated with spoiled potato tissue. The rapid spread of mycelium across the PDA medium demonstrates the high adaptability of storage fungi in carbohydrate-rich substrates.

The control PDA plate remained largely free from microbial contamination, validating the reliability of the procedure.

The present study confirmed that spoiled potatoes contain a diverse range of microorganisms including bacteria and fungi. Nutrient Agar supported the growth of bacterial colonies that may belong to spoilage-associated genera such as *Pectobacterium*, *Bacillus*, *Pseudomonas*, and *Erwinia*. These organisms are commonly involved in enzymatic degradation of plant tissues leading to soft rot symptoms.

Fungal growth on PDA indicated contamination by storage moulds. The white cotton-like growth with green sporulatingcenters resembles fungal genera such as *Aspergillus*, *Penicillium*, or *Rhizopus*, which are frequently isolated from spoiled vegetables and stored tubers. Similar observations were reported by Snowdon (1990), who described fungal invasion as a major factor in post-harvest losses of potatoes.

Environmental factors such as humidity, poor ventilation, mechanical injury, and improper storage temperature favour the growth of spoilage microorganisms. The microorganisms utilize starches and nutrients present in potato tissues, resulting in tissue breakdown, discoloration, unpleasant odour, and reduced shelf life.

The findings of this study emphasize the importance of proper storage hygiene, temperature regulation, and careful handling of potatoes to prevent microbial contamination and economic losses.

CONCLUSION

The study successfully isolated and observed microorganisms associated with spoiled potato samples using Nutrient Agar and Potato Dextrose Agar media. Bacterial colonies were prominently observed on Nutrient Agar, while extensive fungal growth developed on PDA plates. The results indicate that both bacteria and fungi actively participate in potato spoilage under favourable conditions. Fungal colonies exhibited cottony white growth with sporulatingcenters, whereas bacterial colonies showed varied morphological characteristics. Proper sanitation, controlled storage conditions, and careful handling are essential to reduce microbial spoilage and increase the shelf life of potatoes. The investigation highlights the significance of microbiological monitoring in food preservation and post-harvest management.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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