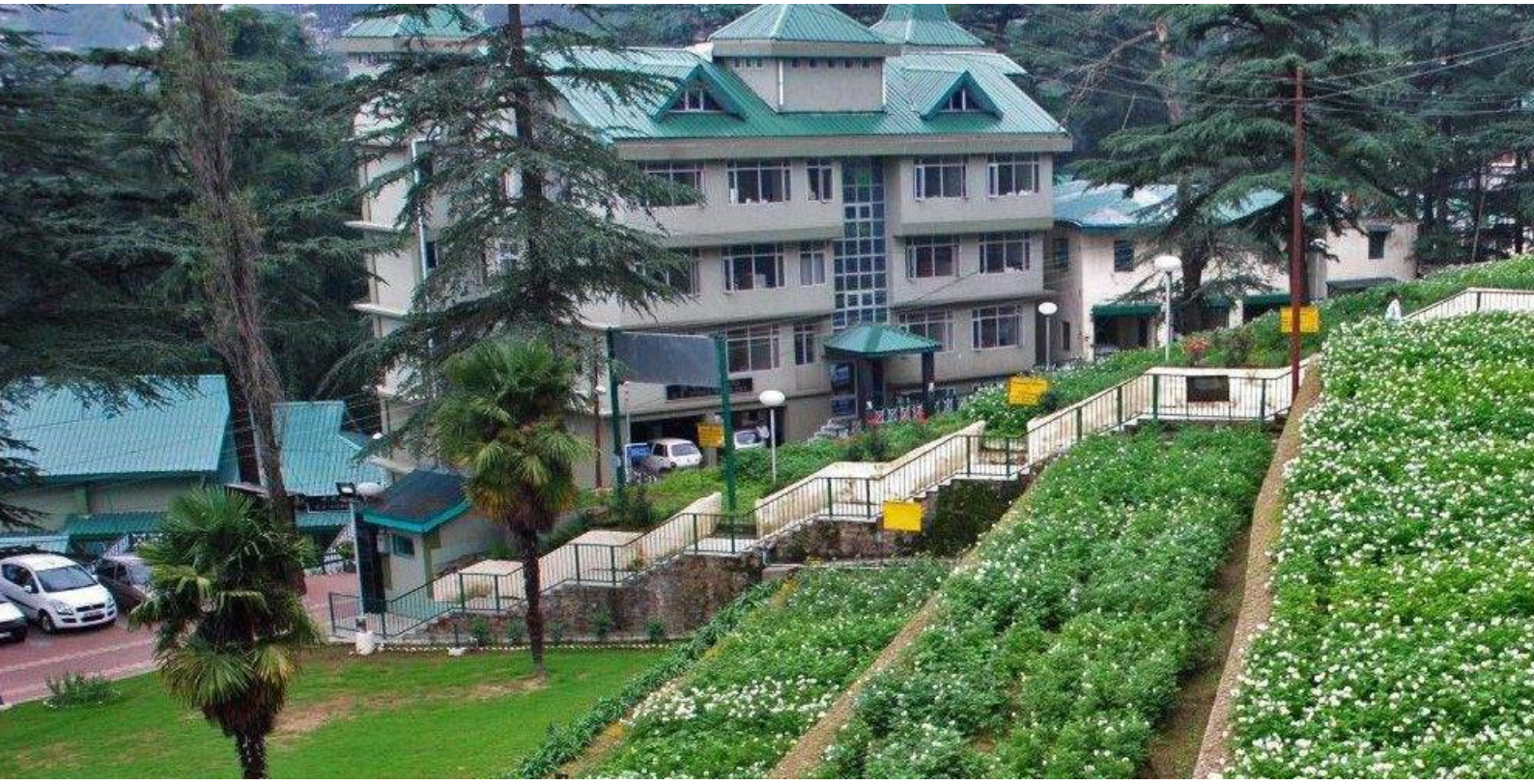

Role of Microbes

in Potato and Potato-Based Products

Dharmendra Kumar,* Som Dutt, Pinky Raigond, Sushil S Changan, MK Lal, RK Tiwari and Brajesh Singh

ICAR-Central Potato Research Institute, Shimla, 171001, Himachal Pradesh, India

***Corresponding Author** Email: *dharmendra.kumar1@icar.gov.in*,

ORCID ID: https://orcid.org/0000-0003-2784-9648

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Introduction

Potato (*Solanum tuberosum* L.) is a non-cereal food crop that has been growing worldwide, fourth in the world following wheat, maize, and rice, with global potato production estimated to be 400 million tonnes in 2021. Potatoes are grown in over 100 countries, feeding over a billion people and providing a key source of nutrition for people.

As a result, increasing the productivity and quality of potato crops can help in meeting the nutritional growing demands.

India is the second-largest country after China in terms of world total potato production. Out of the total potato production, 68% is consumed as fresh, 8.5% as seed, 7.6% for processing and approximately 16% go waste. Therefore not only need to increase the production of potato but also need to reduce the wastage of potato. Microbes play important role in production, protection and processing. So in this article describes the role of microbes in potatoes and potato-based products.

Figure 1: Potato growing field in the Himalayan hill area

Microbes associated with potato

The microbes that make up the potato and potato product microflora are vast and diverse. As with any fresh product, the numbers of these microorganisms on potatoes can fluctuate substantially depending on environmental circumstances present during growing, harvest, postharvest handling, and processing.

Table 1: Enlist the microorganisms which are associated with potatoes and potato-based products

S. No.	Microbes associated with potato
A	**Gram-positive endospore-forming rods and cocci** *Bacillus cereus,* *Bacillus licheniformis,* *Clostridium sp*
B	**Gram-positive cocci** *Staphylococcus aureus,* *Streptococcus sp*
C	**Gram-positive rod** *Lactobacillus sp.* *Listeria monocytogenes* *Listeria innocua* *Listeria welshimeri* *Corynebacterium sepedonicum* *Cytophaga*
D	**Facultatively anaerobic gram-negative rods** *Enterobacter cloacae* *Erwinia carotovora* *Erwinia herbicola* *Escherichia coli* *Klebsiella oxytoca* *Salmonella* *Shigella*
E	**Gram-negative aerobic/microaerophilic rods and cocci** *Pseudomonas fluorescens* *Pseudomonas luteola* *Pseudomonas maltophila* *Pseudomonas marninalis* *Pseudomonas pseudomallei* *Pseudomonas solanacearum* *Xanthomona*
F	**Filamentous fungi, yeast and viruses** *Alternaria solani* *Aspergillus* *Cladosporium* *Fusarium sp.* *Helminthosporium solani* *Phytophthora infestans* *Penicillium* *Spongospora* *Verticillium*

Microbes scope in potato production

To increase potato output, researchers have used a variety of techniques, including plant residues, chemical fertilisers, soil conditioners, and helpful microbial products. Biocontrol agents are of enormous importance since they are environmentally friendly and comply with sustainable agriculture practices. *Bacillus sp., Streptomyces sp., Pseudomonas sp.,* and *Trichoderma sp.* are examples of bacteria and fungi that have been shown to boost plant development and increase agricultural output when used as biofertilizers. Many such methods have been suggested or illustrated to describe the potential benefits of these microorganisms on plant growth and yield, including direct promotion of plant growth by facilitating resource acquisition (nitrogen, phosphorus, and essential minerals) or regulating plant hormone levels, or indirect reduction of phytopathogen inhibitory impact through biocontrol activity. More facts on the plant growth-promoting rhizobacteria used by biocontrol agents, particularly when a consortium is involved. Beneficial interactions between soil bacteria and roots provide plants with a proportion of the nutrients they require for growth. Microbes can solubilize forms from the unsoluble form that are easily absorbed by plants. Microorganisms in the rhizosphere play a crucial role in plant growth. Plant growth is promoted by nutrient intake, carbon cycling, nitrogen fixation and cycling, and phytohormone production. Alternatives to increasing agricultural output are microbial-based techniques.

Role of microbes in potato diseases

Plants are rich in diverse colonies of archaea, bacteria, viruses and fungi known as endophytes. The bacteria that colonise a plant's rhizosphere have attracted the most attention. They are a major source of microorganisms, which are absorbed by plant roots and colonise the interior of the plant as endophytes. Over the last two decades, scientists have been studying the bacterial communities in potato plants to boost agricultural output. Several biotic and abiotic elements, such as plant developmental stage, plant health and diseases, insects, human activities, and environmental conditions or soil types, are known to influence plant development. Researchers found that the effect of plant genotype on bacterial community structure in potatoes was modest or inconsistent over time or field sites, whereas the soil was identified as the primary driver of bacterial community composition in potato plants. The microbiota of plants is well-known for its importance in the host's healthy growth and development, and it has been revealed to play a role in preventing or favouring rots, as well as avoiding quality loss due to sprouting, saccharification, water loss, or spoiling. Taking this into account, it appears likely that the microbial populations that colonise potato tubers have an impact on their behaviour during storage. The bacterial populations linked with tubers of various potato cultivars in later generations and grown in various soils were

investigated.

Bacterial, fungal and viral infections are some of the most significant biotic restrictions to potato production, particularly in tropical and subtropical areas, as well as some warm temperate zones. These infections affect potatoes worldwide, causing significant harm, particularly to tubers, the plant's most commercially important portion. The most serious diseases are bacterial wilt, late blight, scab and viral and back leg, whereas potato ring rot, pink eye is minor.

Microbes associated with potato in processing

On fresh, minimally processed, and completely processed potato products, a plethora of spoilage and harmful microorganisms can be found. Potatoes come in a variety of forms, including frozen, dried, ready-to-eat, and minimally processed. Natural microflora, processing, handling, and personal interaction all influence the microbiological quality of finished potato products. Soil and airborne inocula, agricultural practises, harvesting procedures, and storage conditions all influence the indigenous microflora of potatoes. All of the causes and factors affecting the natural microflora, as well as the processes applied to the product, influence the microbiota of processed products. The need of safeguarding the microbiological safety of new and existing potato products is highlighted by increased customer demand. The origins of microorganisms, microflora, foodborne disease pathogens, and outbreaks related to potatoes and potato products, as well as selected microbiological research concerning potatoes and potato products.

Conclusion

The microbes are significantly associated with the potato crop. The microbes may beneficial and harmful to potato and potato products. Microbes play an important role from sowing to the consumption of potatoes. In the processing, sector microorganisms play an important role so need more explore these areas.