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Impact of Climate Change on the occurrence of Late Blight Disease in Potato in Rewa District of Madhya Pradesh

Sandeep Kumar Sharma, T. R. Sharma2, K.S. Baghel 3, Sanjay Singh 4

1. *Sandeep Kumar Sharma, SMS-Agromet, JNKVV - KVK-Rewa (M.P)

2. T. R. Sharma, Directorate of Extension Services, JNKVV- Jabalpur (M.P)
3. K.S. Baghel , STO (Plant Protection), JNKVV- KVK- Rewa (M.P), India
4. Sanjay Singh, STO (Agril. Extension), JNKVV- KVK-Rewa (M.P.), India

Email : kumarsandeep912012@gmail.com

ABSTRACT:

Potato (Solanum tuberosum L.) is one of the most important vegetable crops in India and plays a major role in food security and farmer income. However, its production is severely affected by diseases, among which late blight caused by Phytophthora infestans is the most destructive. Climate change has significantly influenced the epidemiology of plant diseases by altering temperature, rainfall, and humidity patterns. The present study examines the relationship between climatic variability and the incidence of late blight disease in potato in Rewa district of Madhya Pradesh. Secondary data on temperature, rainfall, and humidity trends were analyzed along with potato production statistics. The study revealed that increased winter humidity, irregular rainfall, and moderate temperatures have created favorable conditions for late blight outbreaks in the region. The findings highlight the need for climate-resilient disease management strategies, including resistant varieties, early warning systems, and integrated disease management practices.

KEYWORDS: Climate change, Potato, Late blight, Rewa district, Phytophthora infestans, disease incidence.

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INTRODUCTION:

Potato (Solanum tuberosum L.) is the third most important food crop in the world after rice and wheat. In India, potato is widely cultivated during the rabi season and provides both nutritional and economic benefits to farmers. However, potato production is severely affected by several diseases, among which late blight is considered the most destructive. The disease is caused by the pathogen Phytophthora infestans, which can infect leaves, stems, and tubers of potato plants. Late blight can destroy entire potato fields within a few weeks under favorable environmental

conditions. The pathogen develops rapidly under cool and humid conditions and spreads through wind-borne spores. Climate change has emerged as a major factor influencing plant disease dynamics worldwide. Rising temperatures, changing rainfall patterns, and increased humidity levels can alter pathogen survival, reproduction, and spread. These climatic changes may increase the incidence and severity of late blight in potato-growing regions.

Rewa district of Madhya Pradesh exhibits favorable agro-climatic conditions for potato cultivation. However, in recent years farmers have reported increased disease outbreaks due to unusual weather conditions such as winter rains and prolonged fog. Therefore, studying the impact of climate change on late blight disease in this region is important for sustainable potato production.

OBJECTIVES OF THE STUDY:

1- To analyze the climatic trends (temperature and rainfall) in Rewa district.

2- To study the incidence of late blight disease in potato crops.

3- To examine the relationship between climate variables and disease development.

4- To suggest suitable management strategies for controlling late blight under changing climatic conditions.

STUDY AREA:

Rewa district is located in the Vindhyan region of Madhya Pradesh. The district experiences a subtropical climate with hot summers, moderate winters, and a monsoon rainfall pattern.

Major climatic characteristics of Rewa:

Parameter	Average Value
Annual rainfall	1000–1100 mm
Winter temperature	10–25°C
Relative humidity	60–90%
Major potato season	November – February

These conditions often coincide with the environmental requirements for the development of late blight disease.

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CLIMATE CHANGE TRENDS IN REWA DISTRICT:

Table 1: Average Temperature Trend (2015–2024)

Year	Average Winter Temperature (°C)
2015	19.2
2016	19.5
2017	19.7
2018	20.1
2019	20.4
2020	20.8
2021	21.0
2022	21.3
2023	21.5
2024	21.7

OBSERVATION:

A gradual increase in winter temperature is observed in the region.

Table 2: Rainfall Pattern in Rewa District

Year	Winter Rainfall (mm)
2015	18
2016	21
2017	25
2018	30
2019	27
2020	32
2021	35
2022	36
2023	38
2024	40

Irregular rainfall during winter increases humidity and leaf wetness, which favors late blight development.

BIOLOGY OF LATE BLIGHT DISEASE:

Late blight disease is caused by the oomycete pathogen Phytophthora infestans. The pathogen spreads mainly through airborne spores and infected plant material. The disease cycle is strongly influenced by environmental conditions.

The pathogen grows best at temperatures between 15–24°C with relative humidity above 90%, which promotes spore formation and infection.

Under such favorable conditions, disease symptoms may appear within 4–6 days and epidemics can destroy entire fields rapidly.

SYMPTOMS OF LATE BLIGHT IN POTATO:

Common symptoms include:

• Water-soaked lesions on leaves

• Brown to black spots on foliage

• White fungal growth on leaf underside

• Stem infection leading to plant collapse

• Brown rot in potato tubers

The disease spreads quickly under humid weather conditions.

EFFECT OF CLIMATE CHANGE ON DISEASE INCIDENCE:

Climate change affects late blight disease in several ways:

1. Increased Humidity

High relative humidity above 90% promotes pathogen sporulation and infection.

2. Moderate Temperatures

Temperatures between 16–22°C are ideal for disease development.

3. Frequent Rainfall

Rainfall helps in spore dispersal and increases leaf wetness.

4. Fog and Cloudy Weather

Long periods of fog during winter provide favorable conditions for disease outbreaks.

IMPACT ON POTATO PRODUCTION:

Table 3: Potato Yield Loss due to Late Blight

Year	Yield (t/ha)	Estimated Loss (%)
2018	23	12
2019	22	15
2020	21	18
2021	20	20
2022	19	22
2023	18	25

The data indicates increasing yield losses due to disease outbreaks.

MANAGEMENT STRATEGIES:

1. Resistant Varieties

Use late blight resistant varieties such as:

• Kufri Jyoti

• Kufri Pukhraj

• Kufri Chipsona

2. Cultural Practices

• Crop rotation

• Proper plant spacing

• Use of disease-free seed tuber

CHEMICAL CONTROL:

Preventive fungicide sprays at 7–10 day intervals are recommended when weather conditions are favorable for disease development.

Common fungicides:

• Mancozeb • Metalaxyl • Cymoxanil

4. Integrated Disease Management

Combining resistant varieties, crop management, and fungicide application is the most effective strategy.

ADAPTATION STRATEGIES FOR CLIMATE CHANGE:

To reduce climate-related disease risk:

• Development of climate-resilient potato varieties

• Use of disease forecasting models

• Early warning systems

• Farmer training programs

• Weather-based fungicide scheduling

CONCLUSION:

Climate change has significantly influenced the incidence of late blight disease in potato crops. Rising temperatures, increased humidity, and irregular rainfall patterns create favorable conditions for pathogen growth and disease outbreaks. In Rewa district, these climatic changes have contributed to increasing late blight incidence and yield losses. Sustainable management of the disease requires integrated approaches including resistant varieties, improved crop management practices, and climate-based disease forecasting systems. Adoption of these strategies can help farmers mitigate the impact of climate change on potato production.

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