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Impact of Weather Parameters on the Incidence of Leaf Blight Disease in Taro (Colocasia esculenta)

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ABSTRACT:

Taro (*Colocasia esculenta*) is an important tuber crop grown widely in tropical and subtropical regions. The crop is severely affected by leaf blight disease caused by the pathogen *Phytophthora colocasiae*. The occurrence and severity of this disease are strongly influenced by weather parameters such as temperature, relative humidity and rainfall. The present research paper aims to analyze the relationship between weather conditions and the incidence of taro leaf blight. Data on temperature, relative humidity, rainfall and disease incidence during different months were analyzed. The results related that disease incidence started during August and gradually increased up to October under conditions of moderate temperature, high relative humidity and frequent rainfall. Maximum disease incidence was observed when the minimum temperature was around 20°C and relative humidity exceeded 85%. Proper understanding of these weather parameters my be essential in forecasting disease outbreaks and adopting timely management practices.

KEYWORDS: Taro (*Colocasia esculenta*), Taro Leaf Blight, *Phytophthora colocasiae*, Weather Parameters, Temperature, Relative Humidity, Rainfall, Disease Incidence

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INTRODUCTION:

Taro (*Colocasia esculenta*) is one of the most important tropical root crops cultivated for its edible corms and leaves. It is widely grown in many parts of Asia, Africa and the Pacific Islands and plays an important role in food security and nutrition in these regions. According to **Peter J. Matthews (2004)**, taro is among the oldest cultivated root crops and has been an important staple food for thousands of years in tropical agriculture. The crop grows well under warm and humid

climatic conditions and is generally cultivated during the rainy season. **G. V. H. Jackson (1999)** observed that taro performs best in areas with high rainfall and moderate temperature, but these same environmental conditions also favor the development of several fungal and oomycete diseases. Despite its importance, taro production is greatly affected by several diseases. Among them, taro leaf blight caused by *Phytophthora colocasiae* is considered the most destructive disease affecting taro cultivation worldwide. **Ernest E. Trujillo et al. (2002)** reported that taro leaf blight can cause severe epidemics leading to heavy yield losses in many taro-growing regions. The disease affects the leaves, petioles and sometimes the corms of the plant, resulting in significant reduction in photosynthetic activity and yield. According to **Scot C. Nelson (2011)**, severe outbreaks of taro leaf blight can cause yield losses ranging from **30–50%**, particularly under favorable environmental conditions.The development and spread of leaf blight are strongly influenced by environmental factors. Weather parameters such as temperature, relative humidity, rainfall and cloudy conditions provide favorable conditions for the growth and multiplication of the pathogen. **Junji Ooka (1990)** emphasized that warm temperature combined with high relative humidity and frequent rainfall significantly increases the severity of taro leaf blight. Therefore, understanding the relationship between weather parameters and disease incidence is essential for developing effective disease forecasting and management strategies.

WEATHER PARAMETERS AND DISEASE INCIDENCE:

Weather conditions during the crop growth period play a significant role in the occurrence and severity of leaf blight disease in taro. The following table summarizes the relationship between weather parameters and disease incidence.

Month	Max Temp (°C)	Min Temp (°C)	RH1 (%)	RH2 (%)	Rainfall (mm)	Rainy Days	Plants Affected /10
June	40.8	26.6	58	40	86.8	9	0
July	34.4	24.8	85	68	239.8	15	0
August	31.2	22.4	88	76	298.5	14	4
September	27.1	19.3	94	90	267	9	6
October	32.3	17.4	88	71	78.9	5	8

DISEASE PROGRESS DURING CROP SEASON:

Leaf blight incidence in taro was first observed during the second fortnight of August, coinciding with the onset of monsoon conditions. Initially the disease incidence was low, but it gradually increased as favorable weather conditions developed. In August, around 4 plants out of 10 were affected by the disease. During September the incidence increased further to 6 plants per 10, indicating rapid spread under high humidity and rainfall conditions. The highest incidence was recorded in October, where 8 plants out of 10 were infected by leaf blight. After October, disease severity gradually declined during the months of November to January due to decreasing humidity and changes in temperature conditions.

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Figure 1. Leaf Blight symptoms on Taro leaf

INFLUENCE OF WEATHER PARAMETERS:

The development of taro leaf blight was strongly influenced by minimum temperature and relative humidity. The disease incidence was found to be maximum when:

- Minimum temperature around 20.3 ± 2°C was found to be highly favorable for disease development.
- Maximum relative humidity of about 87.3% created suitable conditions for pathogen growth and infection.

High rainfall and cloudy weather conditions also favored the rapid spread of the pathogen in the field. Continuous leaf wetness during the rainy season created a suitable environment for pathogen growth and infection.

Similar observations were reported by **Mishra, A.K., Sharma, K. and Mishra, R.S. (2008)** who reported that cloudy weather with intermittent rains and temperature around **28°C** significantly increased the spread of leaf blight disease in taro fields.

Ooka (1990) reported that the development of taro leaf blight caused by *Phytophthora colocasiae* is highly dependent on warm and humid environmental conditions. The pathogen grows rapidly when temperature ranges between **25–30°C** and relative humidity remains above **90%**.

According to **Trujillo et al. (2002)**, epidemics of taro leaf blight generally occur during the rainy season when prolonged leaf wetness and cloudy weather prevail. Under such conditions, the pathogen produces large numbers of sporangia that spread rapidly through rain splash and wind.

Similarly, **Singh et al. (2012)** observed that disease severity increases significantly when relative humidity exceeds **85%** and minimum temperature remains between **18–22°C**.

Nelson et al. (2011) also emphasized that frequent rainfall and longer leaf wetness periods are major factors responsible for the rapid development of taro leaf blight epidemics.

EFFECT ON CROP GROWTH AND YIELD:

Leaf blight disease directly affects the vegetative growth of the crop. Severe infection leads to:
• drying of leaves
• reduction in photosynthetic area
• poor corm development.

As a result, significant yield reduction occurs. In severe cases the disease can cause 30–50% yield loss under favorable environmental conditions.

DISEASE MANAGEMENT:

Proper disease management practices can reduce the severity of taro leaf blight and protect crop yield.

1. Low Cost Management for Farmers:

Farmers should regularly monitor their fields during the monsoon season and adopt preventive measures to reduce disease spread.

2. Chemical Control:

Application of Metalaxyl with copper (Ridomil Plus 72 WP @ 0.3%) is highly effective in controlling taro leaf blight.

• Spray at 15 day intervals
• Use knapsack sprayer
• Begin spraying at the early stage of disease appearance

Regular spraying under favorable weather conditions can significantly reduce disease incidence.

CONCLUSION:

The incidence of taro leaf blight was closely associated with weather parameters. The disease started appearing in August, increased gradually during September and October, and declined afterwards during the winter months. Moderate temperature high relative humidity and frequent rainfall were found to be the most favorable conditions for disease development. Therefore, monitoring weather parameters can help in predicting disease outbreaks and implementing timely management strategies.

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