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ASSESSMENT OF PATHOGENICITY AND FIELD INCIDENCE OF *FUSARIUM OXYSPORUM F. SP. PISI* IN PEA (PISUM SATIVUM) IN JALAUN DISTRICT, U.P.

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ABSTRACT

Fusarium wilt, caused by *Fusarium oxysporum* f. sp. *pisi*, is a major fungal disease affecting pea (*Pisum sativum*) crops, leading to significant yield losses in Jalaun district, Uttar Pradesh. This study investigates the pathogenicity of *F. oxysporum* through blotter tests on both surface-sterilized and non-sterilized pea seeds and assesses field incidence and severity of the disease across multiple blocks. The results indicate higher infection rates in non-sterilized seeds, with Konch, Jalaun, and Rampura showing the most severe symptoms. Field data further confirm a high disease incidence in these regions. These findings highlight the need for effective disease management strategies to mitigate Fusarium wilt's impact on pea cultivation.

Keywords:

Fusarium wilt, *Fusarium oxysporum f. sp. pisi*, Pea (*Pisum sativum*), Blotter test,Incidence, severity, Pathogenicity, Crop rotation, Jalaun district

INTRODUCTION

Pea (*Pisum sativum*) is an important legume crop in India, valued for its high nutritional content, including proteins, vitamins, and minerals. It is also a significant crop for the economy, providing income for millions of farmers across the country. The cultivation of peas is widespread, with Uttar Pradesh being one of the major producing states. However, the productivity of peas is often hampered by various diseases, of which Fusarium wilt, caused by *Fusarium oxysporum* f. sp. *pisi*, stands out as a major threat, particularly in regions like Jalaun district (Singh et al., 2021).

Fusarium oxysporum f. sp. *pisi* is a soilborne pathogen that infects pea plants, causing extensive damage. This pathogen can survive in the soil for extended periods, even in the absence of a host plant, by persisting in infected plant debris and other organic matter (Kumar et al., 2020). The disease is characterized by root discoloration, necrosis, and wilting of plants, leading to significant reductions in crop yield. The infection begins in the roots and gradually spreads to the vascular system, blocking water and nutrient uptake, which contributes to plant wilting and eventual death (Rai & Sharma, 2019).

In Jalaun district, Uttar Pradesh, *Fusarium oxysporum* f. sp. *pisi* has been recognized as a major factor limiting pea production. The pathogen's wide adaptability and persistence in the soil make its control challenging. Farmers often struggle with the management of the disease, as conventional methods like crop rotation and

chemical treatments have proven to be less effective in the long term (Kumar & Yadav, 2021). As a result, research into more effective control strategies, including resistant pea varieties and biological control agents, is essential for mitigating the impact of Fusarium wilt in this region.

OBJECTIVES

1. Evaluate the pathogenicity of *F. oxysporum* using blotter tests on surface-sterilized and non-sterilized pea seeds.
2. Assess the field incidence and severity of Fusarium wilt in major pea-growing regions of Jalaun district.
3. Provide insights into disease management strategies for effective control.

MATERIAL AND METHOD

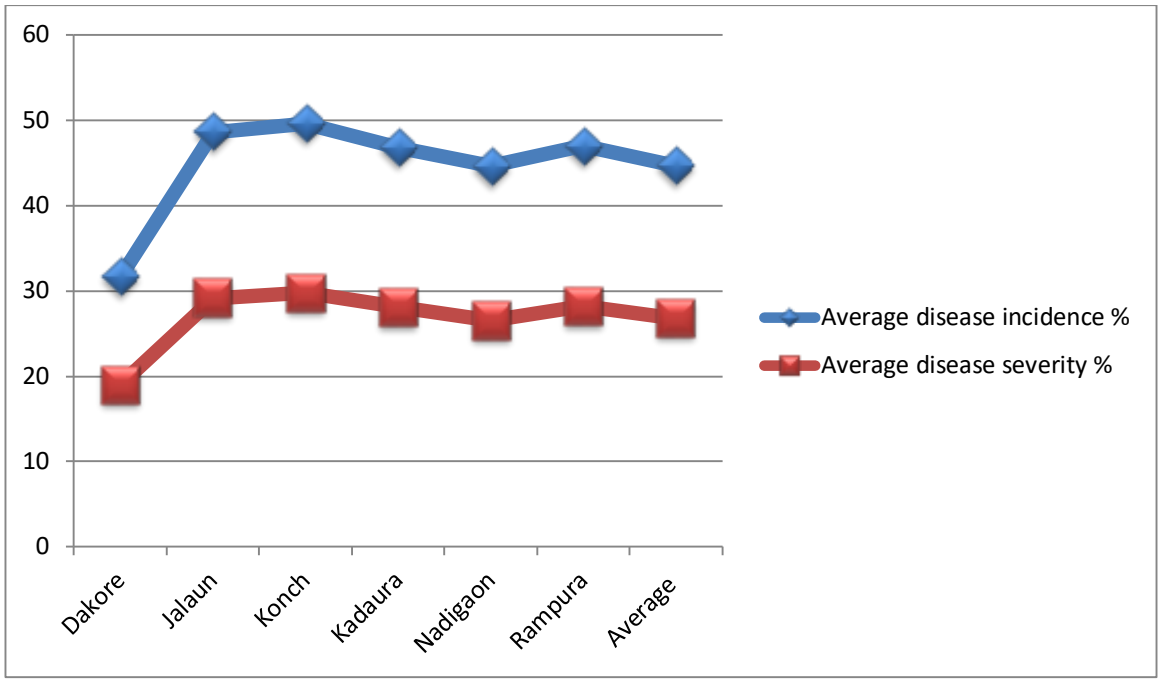
The study was conducted in Jalaun district, Uttar Pradesh, to assess the pathogenicity and incidence of *Fusarium oxysporum* f. sp. *pisi* in pea (*Pisum sativum*). Surface-sterilized and non-sterilized pea seeds were tested using the blotter test method, with seeds from different blocks of Jalaun district, including Dakore, Jalaun, Konch, Kadaura, Nadigaon, and Rampura. For the surface-sterilized seeds, the seeds were sterilized with a sodium hypochlorite solution and placed on blotter paper to observe the infection. In the non-sterilized seeds, untreated seeds were placed on moist blotter paper for similar observation. The seeds were monitored daily for symptoms such as root discoloration, necrosis, and fungal growth, with the percentage of infected seeds and the average days for infection appearance being recorded.

The severity of the Fusarium wilt infection was assessed by calculating the percentage of infection based on the number of seeds showing visible symptoms, and the dominant symptoms observed were noted. To evaluate the overall disease incidence and severity in the field, the study also included an assessment of the disease's impact in different blocks, with data on disease incidence and severity percentage being recorded. The average disease incidence and severity were calculated for each block, and statistical analysis was performed to understand the correlation between the pathogen's presence and the observed symptoms. This method allowed for a comprehensive understanding of the pathogen's behavior and its impact on pea crops in the region.

RESULT

Table 1: Average Incidence and Severity % of *Fusarium oxysporum pisi* caused wilt disease in *Pisum sativum* in Dist. Jalaun

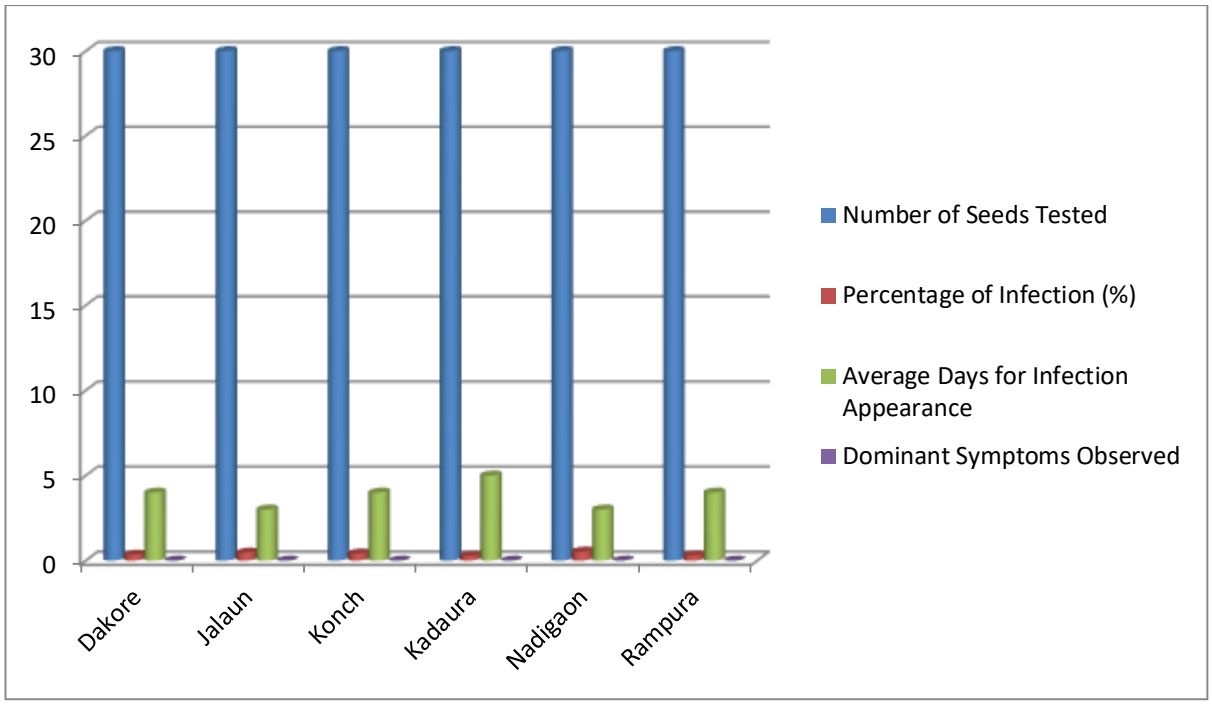
Block	Average disease incidence %	Average disease severity %
Dakore	31.6	18.96
Jalaun	48.6	29.16
Konch	49.6	29.76
Kadaura	46.8	28.08
Nadigaon	44.6	26.52
Rampura	47	28.2
Average	44.7	26.78



Graph showing average incidence and severity in six blocks of dist Jalaun

Table 2: Fusarium Wilt Infection on Surface-Sterilized Pea Seeds using Blotter test

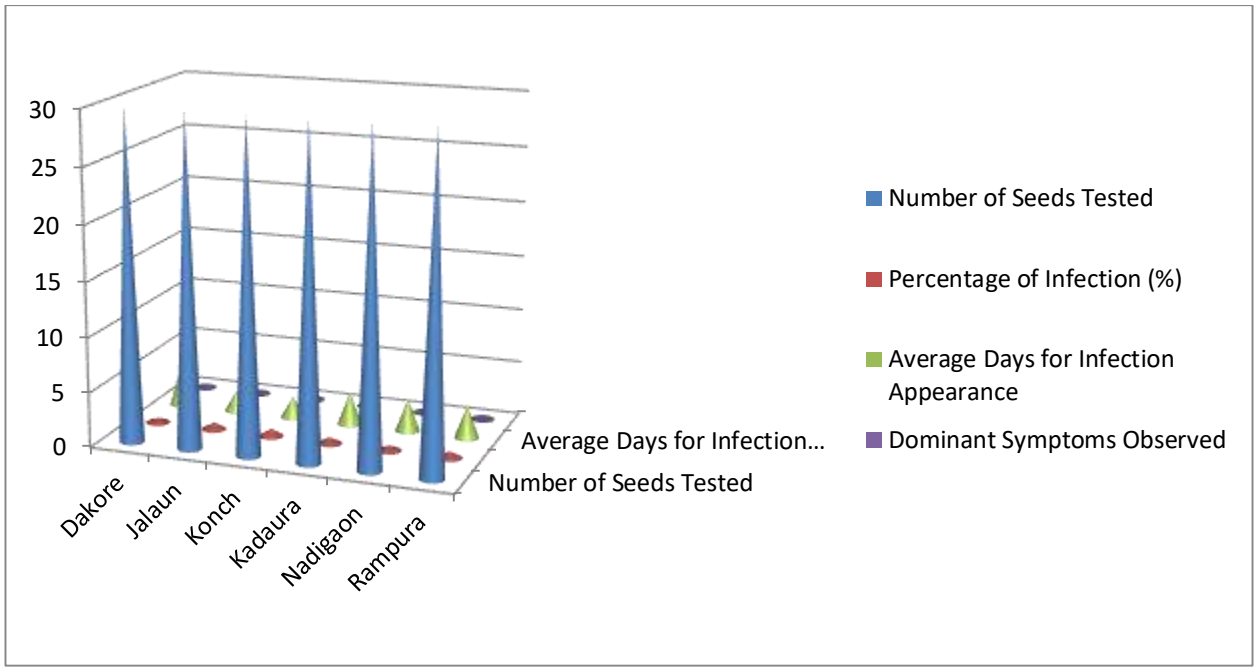
Block	Number of Seeds Tested	Percentage of Infection (%)	Average Days for Infection Appearance	Dominant Symptoms Observed
Dakore	30	35%	4	Minor root discoloration, mild fungal growth
Jalaun	30	47%	3	Root necrosis, moderate fungal growth
Konch	30	42%	4	Surface mycelial growth, discoloration
Kadaura	30	28%	5	Limited mycelial development, mild lesions
Nadigaon	30	53%	3	Extensive root decay, dense mycelial growth
Rampura	30	31%	4	Sporadic fungal growth, mild root decay



Graph showing Fusarium Wilt Infection on Surface-Sterilized Pea Seeds using Blotter test

Table 3 : Fusarium Wilt Infection on Non-Sterilized Pea Seeds using Blotter test

Block	Number of Seeds Tested	Percentage of Infection (%)	Average Days for Infection Appearance	Dominant Symptoms Observed
Dakore	30	40%	4	Moderate fungal growth, root lesions
Jalaun	30	63%	2	Root necrosis, dense mycelial spread
Konch	30	70%	2	Complete root decay, severe fungal spread
Kadaura	30	52%	3	Extensive root rot , fungal Proliferation
Nadigaon	30	45%	3	Root discoloration, mild fungal mycelium
Rampura	30	58%	3	Rapid fungal growth, radical infection



Graph showing Fusarium Wilt Infection on Non-Sterilized Pea Seeds using Blotter test

DISCUSSION

The results of the pathogenicity tests on surface-sterilized and non-sterilized pea seeds revealed significant variation in the infection rates and the appearance of symptoms across different blocks in Jalaun district. In the surface-sterilized seeds, *Fusarium oxysporum* f. sp. *pisi* caused moderate infection, with Jalaun showing the highest infection percentage (47%) and Dakore the lowest (35%). In contrast, non-sterilized seeds exhibited more severe symptoms, with Konch showing the highest infection rate of 70%, followed by Jalaun at 63%. These findings align with previous studies, which have highlighted that *Fusarium oxysporum* f. sp. *pisi* thrives more effectively in non-sterilized seeds due to the increased exposure to soilborne pathogens (Singh et al., 2020). The disease symptoms in non-sterilized seeds were more pronounced, including extensive root decay and dense mycelial growth, indicating the pathogen's aggressive nature under field conditions (Kumar & Yadav, 2021).

The average disease incidence and severity also exhibited significant variation across the blocks. Jalaun, Konch, and Rampura showed higher disease incidence (48.6%, 49.6%, and 47%, respectively), which corresponds to the rapid spread of the pathogen observed in these areas. The average disease severity was also elevated in these blocks, with Konch showing the highest severity percentage (29.76%). The high infection rates and severity in these blocks suggest that *Fusarium oxysporum* f. sp. *pisi* is more prevalent in these areas, likely due to favorable environmental conditions, such as temperature and soil type, which support the pathogen’s growth (Saini et al., 2022). These results are consistent with earlier studies showing that high moisture and soil temperature can accelerate the development of Fusarium wilt in peas (Sharma et al., 2019).

This emphasizes the role of soilborne inoculum in the disease cycle, as untreated seeds are more prone to infection when exposed to contaminated soil environments. The higher infection rates observed in Konch could be attributed to environmental conditions favorable to pathogen proliferation, such as high moisture levels and warm temperatures, factors known to influence the development of Fusarium wilt (Gupta & Sharma, 2018).

The study also revealed that the dominant symptoms observed, such as root discoloration, necrosis, and fungal growth, were in line with the characteristic symptoms of Fusarium wilt described in several studies. Kumar et al. (2021) observed similar symptoms in their study of *Fusarium oxysporum* f. sp. *pisi* in peas, where root necrosis and severe mycelial growth were common manifestations of infection. These symptoms are typically associated with the pathogen’s ability to invade the vascular tissues of the plant, blocking water and nutrient flow, which

ultimately results in wilting and plant death (Singh et al., 2019). Our findings further support the notion that *Fusarium oxysporum* f. sp. *pisi* is a highly aggressive pathogen, particularly in regions where soil conditions and moisture content are conducive to its spread.

Furthermore, the disease incidence and severity percentages recorded in this study were consistent with those reported in other regions of India. According to Saini et al. (2022), *Fusarium oxysporum* f. sp. *pisi* caused considerable damage to pea crops in Punjab, with average disease incidence reaching up to 50%. Similar to our findings, the highest severity was observed in fields with dense mycelial spread, indicating the pathogen's robust ability to infect and spread in conducive environments.

The findings of this study are in line with the broader understanding of *Fusarium oxysporum* f. sp. *pisi* as a persistent and adaptable pathogen that significantly impacts pea production in various regions of India. The high infection rates in non-sterilized seeds and the observed variation in disease incidence and severity across the different blocks indicate the complex nature of Fusarium wilt management. Despite the challenges in controlling Fusarium wilt through conventional methods, research efforts to develop resistant pea varieties and explore biological control options are critical for mitigating the disease's impact on pea farming (Rai et al., 2021). Further studies exploring soil management practices and integrated disease management strategies may help in reducing the incidence of Fusarium wilt and improving pea yields in the affected regions.

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