ISSN 2709–3662 (Print)
ISSN 2709–3670 (Online)
https://doi.org/10.52587/JAF030301
Journal of Agriculture and Food
2022, Volume 3, No.1, pp. 22-33

Screening of brinjal accessions against leaf blight (*Curvularia lunuata*) in relation to epidemiological factors

Muhammad Atiq[1], Isra Naeem[2],Nasir Ahmed Rajput[1],Muhammad Usman[1],Shahid Iqbal[1], Ahmad Nawaz[1],Tahreem Fatima[1], Fahad Yaqoob[1], Muhammad Kashif[1], Mariam Ashraf[1]

Abstract

Brinjal (*Solanum melongena* L.) is susceptible to most disastrous *Curvularia* leaf spot disease which severely affects the eggplant yield, quality, and leads to severe economic losses and becoming an alarming problem for farming community. In this regard, 15 accessions of brinjal were screened against leaf blight. Result showed that two hybrids ("Sandhya F_1", "Chaudry 54 F_1") showed resistant response with 4.72 and 3.95% disease incidence, respectively. Four varieties ("Twinkle star", "Janak F_1", "Rani", "Brinjal 3715") showed moderately resistant response against leaf blight. Two accessions ("Dilnasheen", "EP-273") of them exhibited moderately susceptible and two (Pahuja Black round, Black pearl long) showed susceptible response towards leaf blight. Highly susceptible response was shown by five varieties/advance lines including Local-II Ever green, Black Beauty SSI, Global Round-Desi, Green Gold and Local-I Ever green with 96.68, 94.62, 93.67, 87.66 and 87.43% disease incidence, respectively. All these epidemiological factors (temperature, humidity, rainfall) showed highly positive correlation with disease development. It is concluded that "Sandhya-F_1" and "Chaudry (54)-F1" can be used as resistant varieties against leaf blight disease of brinjal.

Keywords: Fungi, Eggplant, Relative humidity, Sporulation, Rainfall

Article History: **Received:** 20th January, 2022; **Revised: 22**th March 2022, **Accepted: 25**rh March, 2022, online First: 10th April, 2022

[1]*Department of Plant Pathology, Faculty of Agriculture, University of Agriculture, Faisalabad, Pakistan;* [2]*Department of Botany, Faculty of Basic Sciences, University of Agriculture, Faisalabad, Pakistan.* Corresponding author: dratiqpp@gmail.com

Introduction

Brinjal (*S. melongena*) possess multifunctional and health-promoting properties which is considered as poor man's crop, and commercially grown as annual crop worldwide. China was top most producer of eggplant (29.50 Million Tons), India (13.50 million tons), followed by Egypt (1.20 million tons), Iran (0.85 million tons) and Turkey (0.82 million tons). Italy was the main producer (10,031 out of 27,053 million tons) among the European countries. In Pakistan, brinjal crop covers an area of 8575 ha with the annual yield of 10 thousand hg ha^{-1} and production of 87 '000' tonnes (FAOSTAT, 2018).

Curvularia leaf spots appear after the first week on eggplant and comes to be visible on the edges and margins of the leaves very clearly. Each symptom seemed as circular to oblong shaped dark brown lesions along with the chlorotic halos on the leaves of eggplant. On edges, white to grayish-white surrounded by the brownish, reddish-brown or yellow colored margins of leaves seen to be very clear (Sarsaiya et al., 2019). These symptoms can firstly observe on the adaxial portion of leaf and formerly become obvious on the abaxial portion of leaf. Eventually, the leaf spot then perforates the lamina region. These perforations (holes) may differ in diameter and shape as well. Mostly, the fungal lesions initially appear on the younger leaves and a small number of spots may become enlarged with the passage of time while others may possible merge into several blotches (Mattihalli et al., 2018). The dark-brown colonies of fungus (Fig. 1) can be observed on PDA media, the zonate colony having black at the center region and lighter color from an outside. Dark brown, unbranched, septate and geniculate conidiophore was observed under the microscope (Manamgoda et al., 2011). Curvularia species can be epiphytes (Diaz and Oyama, 2007), endophytic (Gautam et al., 2013; Jena and Tayung, 2013), saprophytes (Manamgoda et al., 2014) in addition to pathogens (Akter et al., 2013; Scott and Carter, 2014; Raza et al. 2019) on wide range of host plants. For instance, *C. lunata* initially reported on sugarcane (*Saccharum officinarum*) in Java which considered as a source of Curvularia leaf spot disease on glorybower (*Clerodendrum indicum*)-medicinal plants (Mukarjee et al., 2013) and caused high yield losses. *C. lunata* is responsible for the spread of Curvularia leaf spot of brinjal (Das et al., 2012).

Various control measures have been practice such as horticultural practices, varietal resistance, crop rotation, biological measures and solarization (Kamal et al., 2009). All these methods are eco-friendly (Amini and Sindovich, 2010). Varietal resistance is one of the successful management strategies to control Curvularia leaf spot disease. The losses caused by Curvularia leaf spot disease generally conducive to environmental factors and host susceptibility. Epidemiological factors play a significant role in multiplication and spread of pathogen as well as development of disease (Ullah et al., 2020). Effective management approaches can be established by understanding the role of environmental factors. However, no work has done in Pakistan so far, on characterization of epidemiological factors conducive for the development of Curvularia leaf spot of eggplantl for proper management. Current study was carried out with the hypothesis that, study of different epidemiological factors is helpful for the management of leaf blight disease of bringal. For this purpose, present study was conducted to evaluate the available germplasm under

field conditions and also correlate the epidemiological factors with disease which will make available some knowledge to establish disease predictive model.

Materials and Methods

Research work was conducted in the field area of Department of Plant Pathology, University of Agriculture, Faisalabad (UAF), during 2019 and 2020.

Assessment of Disease incidence on brinjal cultivars under field conditions

Fifteen advanced lines of brinjal were collected from the Ayub Agriculture Research Institute (AARI), Faisalabad. For each advanced line, thirty seeds were sown in Modular Tray contained loamy soil in addition with peat moss (3:1) to obtain maximum seedling survival. The nursery was established, and irrigation was done regularly. All the agronomic practices were done timely for better outcomes. The seedling of eggplant cultivars were raised in nursery and after 40 days of germination was transplanted to field in Department of Plant Pathology, University of Agriculture, Faisalabad. In each row, per variety 10 plants were transplanted with distance of (P×P) 30cm and (R×R) 76.5cm under randomized complete block design (RCBD). A total of 30 seedlings were transplanted per advanced line/variety. After 15 days of transplantation, Curvularia leaf spot was appeared naturally on leaves until the crop reached to harvest stage. Data regarding disease was recorded by using disease rating scale. According to this scale; 0 = highly resistant, 1 = 1-5% resistant, 2 = 6-15% moderately resistant, 3 = 16-30% moderately susceptible, 4 = 31-60% susceptible and 5 = > 61% highly susceptible. PDI of Curvularia leaf spot was recorded weekly during the distinct infection of fungal pathogen. By using the formula mentioned below, the results of disease incidence were interpreted.

$$\text{Disease incidense (\%)} = \frac{\text{No of Infected Plants}}{\text{Total no of observed Plants}} X\,100$$

Characterization of environmental factors conducive for the development of disease

Under field conditions from transplanting to harvesting of eggplant, data regarding the environmental factors comprising of rainfall (mm), environmental temperature (max. and min.), wind speed and relative humidity (%) were collected from the Metrological Station, Department of Crop Physiology, University of Agriculture, Faisalabad (UAF). Disease incidence was recorded and environmental factors were correlated with disease incidence of Curvularia leaf spot via regression and correlation analysis. Least significant difference (LSD) at ($P \leq 0.05$) was used to analyze the data differences and impact of epidemiological factors with disease incidence recorded on brinjal cultivars/advanced lines and were correlated via correlation and regression analysis. By using R-square criteria to select best model, a significant impact on Curvularia leaf spot disease development via regression analysis was determined and plots were designed.

Statistical Analysis

Statistical analysis was done via statistical software (Statistics 8.1). All means were separated by means at probability level $P \leq 0.05$ % (Steel et al. 1997). As analysis of variance (ANOVA), different treatments interaction and combinations were done through Statistics at P = 0.05%.

Results

Assessment of Brinjal germplasm against Curvularia leaf spot under Field conditions

Results revealed that among fifteen brinjal cultivars, five cultivars were observed as highly susceptible (>61%) namely Local-II Ever green, Black Beauty SSI, Global Round-Desi, Green Gold and Local-I Ever green with disease incidence (96.687%), (94.627%), (93.673%), (87.663%) and (87.433%) respectively. While, among them two cultivars which include Pahuja Black round and Black pearl long were considered as susceptible (31-60%) with disease incidence (57.623%) and (54.737%) respectively. Moreover, two eggplant cultivars namely Dilnasheen and EP-273 were recorded as Moderately Susceptible (16-30%) with disease incidence (29.547%) and (23.810%) respectively. Four out of 15 cultivars namely Twinkle star, Janak-F1, Rani and Brinjal-3715 were recorded as Moderately resistant (6-15%) with disease incidence (14.407%), (14.277%), (13.860%) and (13.580%) respectively. However, two (2) cultivars namely Sandhya-F1 and Chaudry (54)-F1 were observed as Resistant (1-5%) with disease incidence (4.727%) and (3.957%) respectively. Relatively similar trend was observed in all of 15 brinjal cultivars when screened against Curvularia leaf spot under field (Fig. 2).

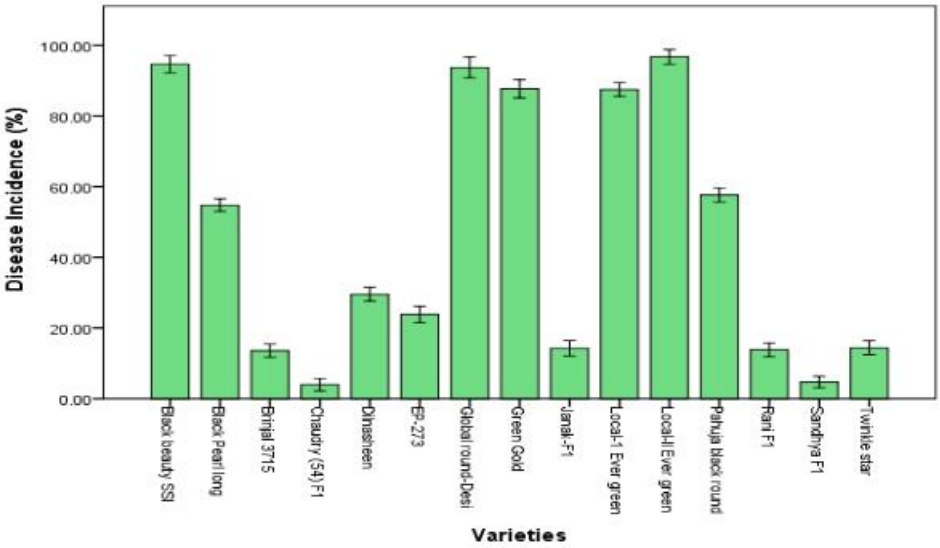

Figure 2. Resistance status of Brinjal germplasm against Curvularia Leaf spot disease under field conditions

Correlation and characterization of environmental factors motive for the development of Curvularia leaf spot disease

Overall correlation with disease incidence and maximum temperature (^{0}C), minimum temperature (^{0}C), relative humidity (%), rainfall (mm), wind speed (ms^{-1}) presented positive and significant results (Table 1). While, three (3) brinjal varieties/advanced lines viz. Janak-F1, Dilnasheen and Green Gold were selected for

characterization of most critical ranges of environmental factors conducive for the development of Curvularia leaf spot of brinjal, in which more than 50% of environmental variables exerted significant influence were plotted as shown in figure (3, 4, 5, 6 & 7), respectively.

Table 1. Correlation of environmental factors with *Curvularia* leaf spot disease on different brinjal accessions

Accessions	Temperature		Relative Humidity (%)	Rainfall (mm)	Wind Speed (km/h)
	Max. T (°C)	Min. T (°C)			
Rani F_1	0.933*	0.936*	0.987*	0.804*	0.919*
	0.000	0.000	0.000	0.009	0.000
Chaudry(54)F1	0.922*	0.932*	0.976*	0.736*	0.901*
	0.000	0.000	0.000	0.024	0.001
Global Round-Desi	0.932*	0.944*	0.981*	0.768*	0.907*
	0.000	0.000	0.000	0.016	0.001
Janak-F1	0.941*	0.942*	0.985*	0.818*	0.928*
	0.000	0.000	0.000	0.007	0.000
Dilnasheen	0.930*	0.940*	0.982*	0.760*	0.911*
	0.000	0.000	0.000	0.017	0.001
Pahuja Black round	0.909*	0.924*	0.974*	0.731*	0.881*
	0.001	0.000	0.000	0.025	0.002
Green Gold	0.951*	0.956*	0.988*	0.817*	0.930*
	0.000	0.000	0.000	0.007	0.000
Black beauty SSI	0.932*	0.942*	0.984*	0.782*	0.910*
	0.000	0.000	0.000	0.013	0.001
Sandhya F1	0.953*	0.966*	0.973*	0.805*	0.921*
	0.000	0.000	0.000	0.009	0.000
EP-273	0.949*	0.955*	0.983*	0.827*	0.929*
	0.000	0.000	0.000	0.006	0.000
Brinjal 3715	0.962*	0.962*	0.975*	0.872*	0.941*
	0.000	0.000	0.000	0.002	0.000
Twinkle star	0.961*	0.961*	0.981*	0.866*	0.946*
	0.000	0.000	0.000	0.003	0.000
Black Pearl long	0.916*	0.929*	0.976*	0.746*	0.895*
	0.001	0.000	0.000	0.000	0.001
Local-I Ever green	0.927*	0.940*	0.978*	0.761*	0.900*
	0.000	0.000	0.000	0.017	0.001
Local-II Ever green	0.940*	0.952*	0.987*	0.772*	0.911*
	0.000	0.000	0.000	0.015	0.000

Upper value indicates the Pearson's correlation coefficient; Lower value indicates the P-value, * = Significant

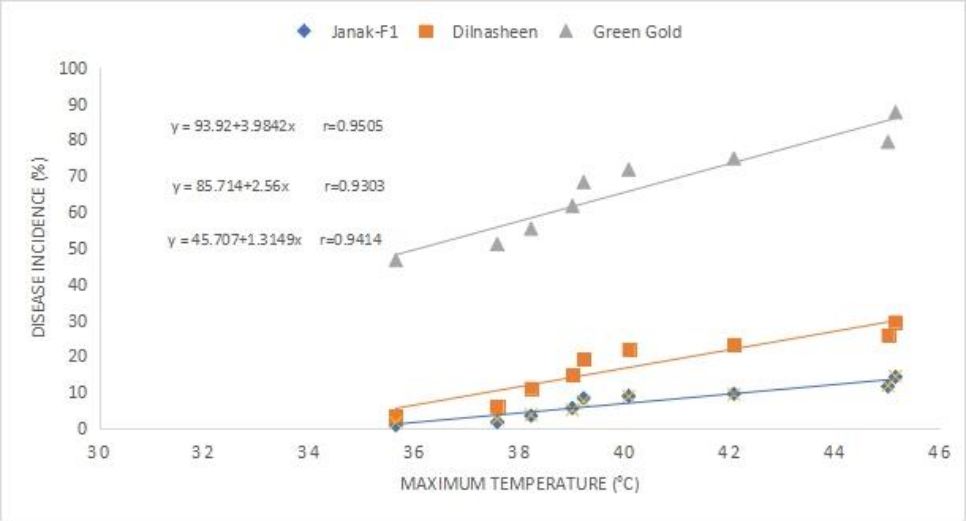

Figure 3. Relationship between maximum temperature (Max. T) and disease incidence of *Curvularia*
Leaf spot disease on advanced lines viz. Janak-F1, Dilnasheen and Green Gold**.**

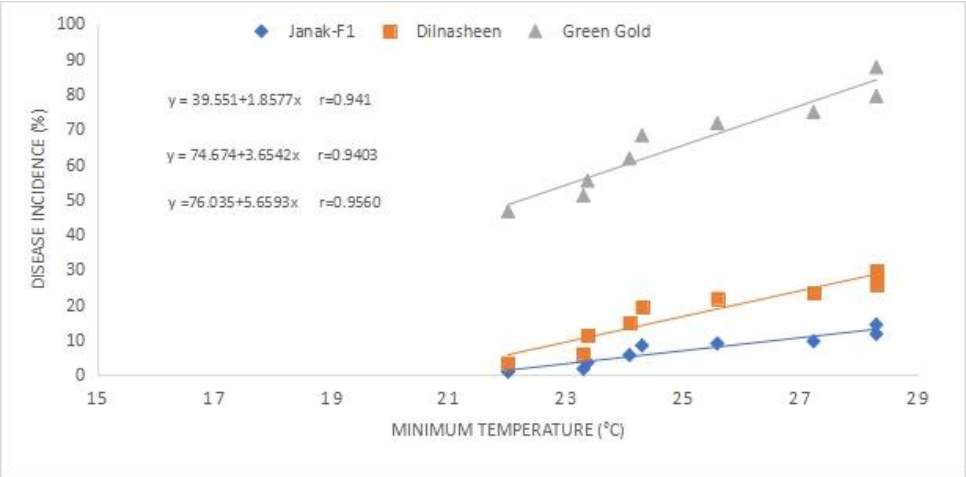

Figure 4. Relationship between minimum temperature (min. T) and disease incidence of Curvularia.

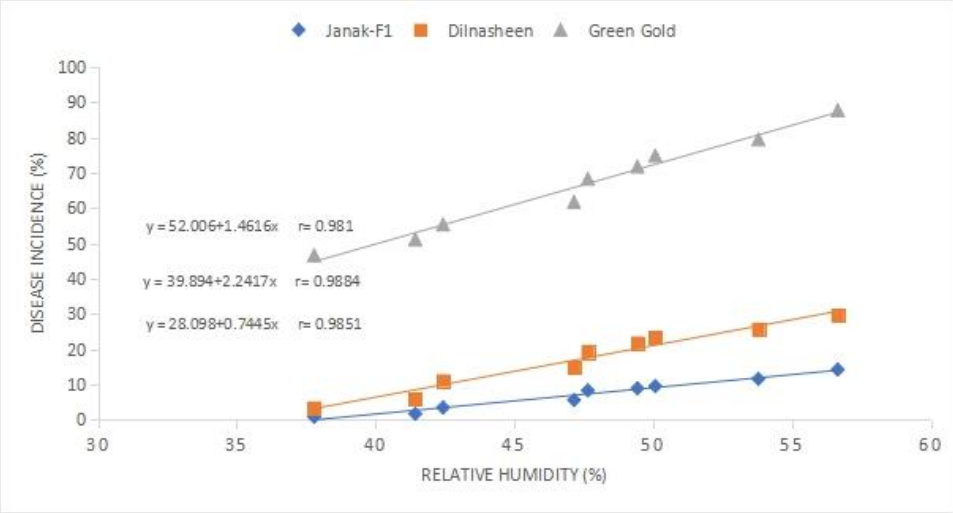

Figure 5. Relationship between relative humidity (%) and disease incidence on advance lines viz. "Janak-F_1", "Dilnasheen" and "Green Gold"

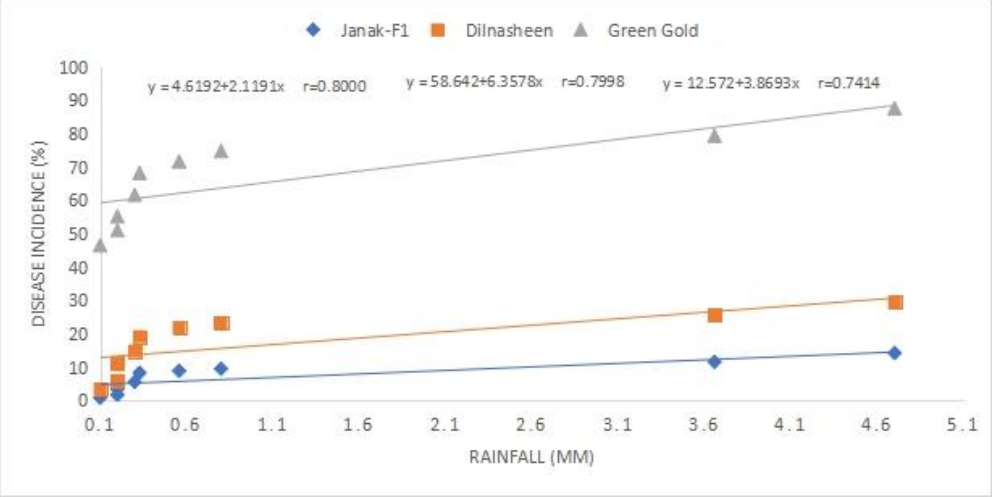

Figure 6. Relationship between Rainfall (mm) and disease incidence of Curvularia leaf spot disease on advanced lines viz. "Janak-F_1", "Dilnasheen" and "Green Gold".

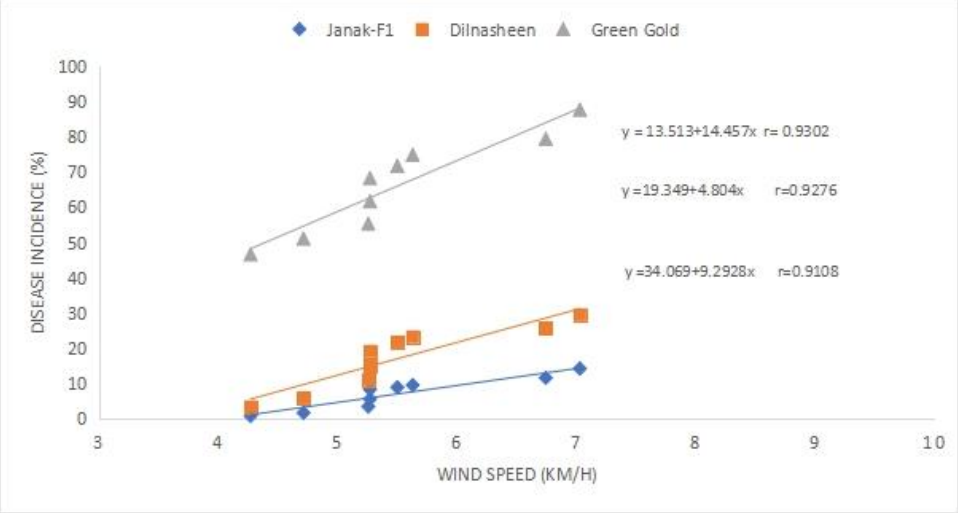

Figure 7. Relationship between wind speed (Km/h) and disease incidence of Curvularia leaf spot disease on advanced lines viz. Janak-F1, Dilnasheen and Green Gold.

Discussion

Resistance status of brinjal germplasm against Curvularia Leaf Spot disease under the field conditions

Curvularia leaf spot caused by *C. lunata* is an alarming threat in brinjal growing areas of Pakistan, causing significant yield losses, and conducive to diverse environmental conditions. Dark brown, small, irregular, circular spots on leaves appeared as characteristics symptoms of Curvularia leaf spot disease (Chaudary et al., 2016). Different factors such as temperature, pH, rainfall and relative humidity affect the growth and sporulation of foliar pathogen *C. lunata* and influence the establishment of symptoms (Pandey, 2010; Singh et al., 2018). Likewise, virulent pathogens, vulnerable host and certain environmental factors contribute to epidemic diseases (Saremi and Amiri, 2010). Therefore, resistant host practices considered to be promising method to reduced disease incidence of various soil-boil diseases for instance *C. lunata* leaf spot. Moreover, resistant advanced lines not only overcome disease incidence but also prevent any toxic and harmful effects of fungicides (Rani et al., 2008). For brinjal eggplant cultivation, high yielding, good quality and disease resistant advanced lines are major concerns. Assessment of genomic diversity in eggplant, are requisite for its innovation. Additionally, recent studies revealed that application of brinjal germplasm having distinctive and diverse DNA profiles leads to introduce inherently diverse breeding populations (Altaye, 2015).

Resistance against many disease causing pathogens also exist in various cultivated brinjal eggplant cultivars. Therefore, resistant varieties are significantly required to fight to various plant pathogenic diseases. Application of molecular approaches for insertion and transfer of resistant genes considered to be expensive and time-consuming, however, screening of brinjal germplasm by means of conventional breeding reflect as easily

approachable to agriculturalists for comparative resistance or susceptibility (Maruti et al., 2014). Moreover, conventional breeding considered as durable and immediate way-out against disease outbreak (Jagtap et al., 2012).

While, in Asian and European countries, introduction of F_1 hybrids demonstrate greater productivity, however, having deprived phenotypic variability which denote losses of eggplant landraces therefore predictably cause genomic loss of brinjal. Furthermore, partial polygenic resistance diminishes disease establishment despite the prevalence of various genes which considered to be more durable contrary to monogenic resistance. In present study, data regarding brinjal germplasm against *C. lunata* was recorded by using disease rating scale. Two brinjal advanced lines/varieties (Sandhya-F_1, Chaudary (54)-F_1) were recorded as resistant to Curvularia leaf spot.

Impact of environmental factors on development of Curvularia leaf spot of Brinjal

Different environmental factors, viz:- max. T and min. T (°C), relative humidity (%), rainfall (mm) and wind speed (km/h) play an important role in growth of fungal diseases on brinjal. The intensity and range of pathogen-plant interaction distinctly influenced by these environmental factors where they determined directly or indirectly almost all the events of pathogenesis. Host-parasite relation, symptoms, development of disease, establishment and spread of infection, survival of pathogen and its life cycles are controlled by these environmental factors. Even after the development of infection sudden fluctuations in environment influences the disease processes either positively or negatively (Pandey, 2010). Pathogen survival can be affected by temperature and relative humidity, although increase in temperatures in the tropical regions considered to be relatively small as compared to predicted for the temperate climates. As temperature, relative humidity and rainfall control the rate of reproduction of various disease causing pathogens (Caffarra et al., 2012).

Environmental factors play a significant role in resistance and susceptibility of host plant (Pandey, 2010). Therefore, present study was conducted in which impact of environmental factors on establishment of disease was recorded. Overall, significant positive correlation of all of the environmental factors included max. and min. temperature, rainfall, relative humidity and also wind speed with Curvularia leaf spot of eggplant was observed. *C. lunata* was confined maximum from March to April (Pandey, 2010) with high disease incidence (87.66%) when temperature range was high a little (28°C to 35°C) with scanty rainfall (4.7mm), high relative humidity (53% to 56%) and high wind speed (4km/h to 7km/h). Fungus was able to grow at wide temperature range (22 to 45°C). As the temperature increased at an optimum range (28°C to 35°C), foliar pathogen-*C. lunata* showed maximum fungal growth. While, at high temperature range (42-45°C) minimum fungal growth of Curvularia leaf spot was observed. Similar results were recorded by Singh et al. (2018), who reported that fungus was able to cultivate best at temperature range of 25°C and 28°C to 30°C and minimum fungal growth was reported at 8°C and 45°C. Moreover, Pandey, (2010) reported that, leaf spoilage of brinjal by Curvularia leaf spot disease may be due to high relative humidity and scanty rainfall.

Conclusion

Proper and successive management scheme need to be introduced in resistant brinjal germplasm. Varietal resistance considered as best strategy for this purpose.

Environmental factors play a significant role in development of various fungal diseases. All the environmental factors expressed significant and positive correlation results with disease incidence of Curvularia leaf spot of Brinjal eggplant on all cultivars.

Acknowledgement

I am grateful to Molecular Phyto-bacteriology Laboratory for providing me research facilities under HEC- NRPU # 9315. .

References

Akter, S., Latif, M.A., Mia, A.T., Ansari, T.H., Islam, M.T. & Rafii, M.Y. (2013). Efficacy of fungicides against grain spot disease in rice (*Oryza sativa*). *Journal of Life Science*, 10(4), 3005–3008.

Altaye, T. (2015). Determination of genetic diversity and population structure in eggplant (Master's thesis, Izmir Institute of Technology).

Amini, J. & Sidovich, D.F. (2010). The effects of fungicides on *Fusarium oxysporum* f. sp. *lycopersici* associated with Fusarium wilt of tomato. *Journal of Plant Protection and Research*, 50(2), 172–178.

Caffarra, A., Rinaldi, M., Eccel, E., Rossi, V. & Pertot, I. (2012). Modelling the impact of climate change on the interaction between grapevine and its pests and pathogens: European grapevine moth and powdery mildew. *Agricultural Ecosystem and Environment*, 148, 89–101.

Chaudary, T., Shahid, A.A., Asif, M., Asghar, F., Majeed, R.A., Ali M. & Anwar, W. (2016). First report of *Curvularia lunata* causing leaf spot disease of *S. melongena* (Eggplant) in Lahore, Pakistan. *Plant Disease*, 100, 2326–2326.

Das, S. N. & Sarma, T. C. (2012). Some micro-fungi and their association on the incidence of diseases of brinjal (*Solanum melongena* L.) in Western Assam. *Bioscan*, 1, 303–306.

Diaz, I.A. & Oyama, K. (2007). Conservation genetics of an endemic and endangered epiphytic *Laelia speciosa* (Orchidaceae). *American Journal of Botany*, 94(2), 184–193.

FAO. (2018). Food and Agriculture Organization. FAOSTAT Production. http://www.faostat.fao.org.

Gautam, A.K., Kant, M. & Thakur, Y. (2013). Isolation of endophytic fungi from *Cannabis sativa* and study their antifungal potential. *Archives of Phytopathology and Plant Protection*, 46, 627–635.

Jagtap, P.P., Shingane, U.S. & Kulkarni, K.P. (2012). Economics of Chilli Production in India. *African Journal of Basic and Applied Science*, 4(5), 161–164.

Jena, S.K. & Tayung, K. (2013). Endophytic fungal communities associated with two ethno-medicinal plants of Similipal Biosphere Reserve, India and their antimicrobial prospective. *Journal of Applied Pharmaceutical Science*, 3, 7–12.

Kamal, A.M., Elyousr, A. & Hashem, M.M. (2009). Biological control of Fusarium wilt in tomato by plant growth promoting yeasts and rhizobacteria. *Journal of Plant Pathology*, 25, 199–204.

Manamgoda, D.S., Cai, L., Bahkali, A.H., Chukeatirote, E. & Hyde, K.D. (2011). Cochliobolus: an overview and current status of species. *Fungal Diversity*, 51, 3–42.

Manamgoda, D.S., Rossman, A.Y., Castlebury, L.A., Crous, P.W., Madrid, H., Chukeatirote, E. & Hyde, K.D. (2014). The genus bipolaris. *Studies Mycology*, 79, 221–288.

Maruti, T.B., Tembhurne, B.V., Chavan, R.L., & Amaresh, Y.S. (2014). Reaction of chilli (*Capsicum annuum* L.) genotypes and hybrids against Fusarium wilt (*Fusarium solani*). *Journal of Spices and Aromatic Crops*, 23(2), 186–191.

Mattihalli, C., Gedefaye, E., Endalamaw, F. & Necho, A. (2018). Plant leaf diseases detection and auto-medicine. *Internet Things*, 1, 67–73.

Meyer R.S., Karol, K.G., Little, D.P., Nee, M.H. & Litt, A. (2012). Phylogeographic relationships among Asian eggplants and new perspectives on eggplant domestication. *Molecular Phylogenetic and Evaluation*, 63, 685–701.

Mukherjee, A. & Bandhyopadhyay A. (2013). New report of leaf spot disease of *clerodendrum indicum* caused by *Curvularia lunata*. *International Journal of Pharma and Bioscience*, 4, 808 – 812

Pandey, A. 2010. Studies on fungal diseases of eggplant in relation to statistical analysis and making of a disease calendar. *Recent Research in Science and Technology*, 2, 01–03.

Rani, G.S.D., Naik, M.K., Patii, M.B. & Patii, M.G. (2008). Screening of chilli genotypes against Fusarium wilt caused by *Fusarium solani* (Mart) Sacco. *Vegetable Science*, 35(1), 49–54.

Raza, M., Zhang, Z. F., Hyde, K. D., Diao, Y. Z., & Cai, L. (2019). Culturable plant pathogenic fungi associated with sugarcane in southern China. *Fungal Diversity*, *99*(1), 1–104.

Salih, Y.A. & Ridha, R.J.A. (2019). A study of eggplant leaf spot disease in greenhouses at Basrah province. *Basrah Journal of Agriculture Sciences*, 32, 182–193.

Samuels, J. (2013). An updated look at the taxonomy of the brinjal eggplant complex. *XV Eucarpia*, 253–261.

Saremi, H. & Amiri, M.E. (2010). Exploration of potato cultivar resistant to the major fungal pathogen on potato wilting disease in Iran. *Journal of Food Agriculture and Environment*, 8(2), 821–826.

Sarsaiya, S., Shi, J. & Chen, J. (2019). A comprehensive review on fungal endophytes and its dynamics on Orchidaceae plants: current research, challenges, and future possibilities. *Bioengineered*, 10, 316–334.

Scott, E.M. & Carter, R.T. (2014). Canine keratomycosis in 11 dogs: a case series (2000–2011). *Journal of American Animal Hospital Association*, 50, 112–118.

Singh, P.C., Tripathi, P.P. & Ramesh, S. (2018). Effect of different media, pH and temperature on growth and sporulation of curvularia leaf spot of brinjal. *HortFlora Research Spectrum*, *7*(1), 78–80.

Steel, R.G.D. (1997). Analysis of variance II: multiway classifications. Principles and Procedures of Statistics: A Biometrical Approach. 3rd Ed. McGraw Hill Book Co., Boston, pp 204–252.

Ullah, S., Atiq, M., Younas, M., Rajput, N.A., Sahi, S.T., Sharif, A., Talib, Z.M., Fatima, K., Majeed, U.M. & Raza, H. (2020). Monitoring of epidemiological factors promotive for the expansion of downy mildew of onion and its

chemotherapeutic management under field conditions. *International Journal of Bioscience,* 16(3), 173–182.

Citation of Article

Atiq, M., Naeem, I., Rajput, N.A., Usman, M., Iqbal, S., Nawaz, A.,Fatima, T., Yaqoob, F., Kashif, M., & Ashraf, M. (2022).Screening of brinjal accessions against leaf blight (*Curvularia lunuata*) in relation to epidemiological factors**.** *Journal of Agriculture and Food, 2(2),* 21–33.