Association of physio-morphic characters with powdery mildew resistance in okra

Jitendar kumar Sharma*

ABSTRACT:

To investigate physio-morphic characters in resistant and susceptible cultivars of okra. 12 okra varieties were screened for powdery mildew resistance in field condition for two year. Among 12 different varieties Sonakshi and Taj-042 showed moderately susceptible reaction. While, the varieties *viz*., R.K.-523, Okra-OH-102, Siri-19, Arka Anamika, Venus, GO-2 and Rani exhibited susceptible, whereas Gitanjali, GAO-5 and Pusa Sawani categorized highly susceptible reaction against powdery mildew of okra. None of the variety was found resistant during both the years. Among the physio-morphic characters of different varieties hair-length on midrib of middle and lower leaves, lamina of upper & lower leaves, hair density on the midrib of upper and lower leaves, veins of lower leaves and lamina of upper and middle leaves exhibited significantly negative correlation with the per cent disease intensity on okra. Similarly, stomatal area of upper, middle and lower leaf and leaf lamina thickness of lower leaves were also found significantly negative correlation with disease intensity. While, stomatal density on upper, middle and lower leaf and stomatal index of upper, middle and lower leaf showed significantly positive correlation with the disease intensity.

KEY WORDS: physio-morphic characters, okra and powdery mildew

CONCLUSION

Our study provides, for the first time in okra, a characterization of the variability of leaf micro-morphological parameters in relation to powdery mildew infection. So from this study we concluded that prevalence of okra powdery mildew was strongly correlated with physio-morphological parameters among 12 varieties of okra. Among the physio-morphological parameters of different varieties Leaf Lamina Thickness, Length of the Trichome, Trichome density and stomatal area exhibited significantly negative correlation with the per cent disease intensity of okra powdery mildew. While, stomatal density and stomatal index showed significantly positive correlation with the disease intensity. So these leaf physio-morphological parameters are thus of potential value when selecting for powdery mildew resistance from progeny or from collected material used in okra breeding programmes.

REFRENCES

1. Anonymous, Indian Horticulture Database Report . 2021-22; pp.1-35
2. Gupta SK, Thind TS. Diseases problems in vegetable production. Scientific Publishers, India, Jodhpur. 2006; pp. 576.
3. Jambhale ND and Nerkar YS. Inheritance of resistance to powdery mildew in okra. National Seminar on Breeding Crop Plants for Resistance to Pests and Diseases, 25-27 May 1983, Coimbatore, Tamil Nadu. 1983.
4. Prabhu AS Pathak KD, Singh RP. Powdery mildew of 'bhindi' (*Abelmoschus esculentus* (L) Moench) in Delhi state. Indian Journal of Horticulture. 1971; 28: 310-312.
5. Raj H, Bhardwaj ML, Sharma IM Sharma NK. Performance of commercial okra (*Hibiscus esculentus*) varieties in relation to disease and insect-pests. Indian Journal of Agricultural Sciences. 1992; 63: 747-748.
6. Sastry KSM., Singh SJ. Effect of yellow vein mosaic virus infection on growth and yield of okra crop. Indian Phytopath. 1974; 27: 294-297.
7. Sohi HS, Sokhi SS. Behavior of okra varieties to damping off, powdery mildew and Cercospora blight. Indian Phytopath., 1973; 26(1):91-92.
8. Sridhar TS, Sinha P. Assessment of loss caused by powdery mildew (*Erysiphe cichoracearum*) of okra (*Abelmoschus esculentus*) and its control. Indian J. Agric. Sci., 1989; 59:606-607.
9. Niks RE, Rubiales D. Potentially durable resistance mechanisms in plants to specialized fungal pathogens. Euphytica. 2002; 124: 201–216.
10. Chattopadhyay S, Ali KA, Doss SG, Das NK, Aggarwal RK, Bandopadhyay TK, Sarkar A, Bajpai AK. Association of leaf micro-morphological characters with powdery mildew resistance in field-grown mulberry (Morus spp.) germplasm. AoB PLANTS. 2011; 1-11
11. Kortekamp A Zyprian E . Leaf hairs as a basic protective barrier against downy mildew of grape. Journal of Phytopathology. 1999; 147: 453–459.

12. Lake JA Wade RN. Plant pathogen interactions and elevated CO_2 morphological changes in favour of pathogens. Journal of Experimental Botany, 2009; 60: 3123-3131.
13. Mendgen K. Fungal attachment and penetration. In: Kerstiens G, ed. Plant cuticles. Oxford: BIOS. 1996; 175–188.
14. Prats E, Gay AP, Mur LAJ, Thomas BJ, Carver TLW. Stomatal lock open, a consequence of epidermal cell death, follows transient suppression of stomatal opening in barley attacked by *Blumeria graminis*. Journal of Experimental Botany. 2006; 57:2211–2226.
15. Vaz Patto MC, Niks RE. Leaf wax layer may prevent appressorium differentiation but does not influence orientation of the leaf rust fungus *Puccinia hordei* on *Hordeum chilense* leaves. European Journal of Plant Pathology. 2001; 107:795–803.
16. Zhang H, Yu G, Wang Q, and Zhang JN . Role of leaf structure in resistance to powdery mildew in water melon. Indian J. Genet. 2014; 75(2):237-241.
17. Ficke A. Gadoury DM, Seem RC, Godfrey D, Dry IB. Host barriers and responses to *Uncinula nector* in developing grape berries. Phytopathology. 2004; 94:438–445.
18. Smith, PH, Foster EM, Boyd LA, Brown JKM. The early development of *Erysiphe pisi* on *Pisum sativum* L. Plant Pathology. 1996; 45:302–309.
19. Vanacker H., Carver TLW, Foyer CH. (). Early H_2O_2 accumulation in mesophyll cells leas to induction of glutathione during the hyper-sensitive response in the barley powdery mildew interaction. Plant Physiology. 2000; 123: 1289–1300.
20. Zeyen RJ, Carver TLW, Lyngkjaer MF. Epidermal cell papillae. In: Belanger RR, Bushnell WR, Dik AJ, Carver TLW, editors. The powdery mildews: a comprehensive treatise. St Paul, MN: ASP Press; 2002; pp. 107–125.
21. Mayee CD, Datar VV. Phytopathometry Bulletin-1.Marathawada Agricultural University, Parbhani, 1986; pp.46.
22. Commenil P, Brunet L, Audran JC . The development of the grape berry cuticle in relation to susceptibility to bunch rot disease. Journal of Experimental Botany. 1997; 48: 1599-1607.
23. Dhanumjayarao K., Jindal PC, Singh R, Srivastava GC, Sharma RC. Biochemical variability studies for disease resistancein grape germplasm against powdery mildew (*Uncinula negator*) (schw) bur along with some varietal characters. Indian J. Agric. Res. 2006; 40(3):212 – 215.
24. Fernandez, AM Prats, E Emersan AA Rubiales D . Characterization of resistance mechanism to powdery mildew (*Erysiphe betae*) in beet (*Beta vulguris*). Phytopathology. 2009; 99: 385–389.
25. Ferris R, Taylor G. Stomatal characteristics of four native herbs following exposure to elevated CO2. Ann. of Botany. 1994; 73: 477 – 453.
26. Ficke A, Gadoury DM, Seem RC, Godfrey D, Dry IB. Host barriers and responses to *Uncinula nector* in developing grape berries. Phytopathology. 2004; 94:438–445.
27. Genre A, Bonfante P. Check-in procedure for plant cell entry by biotrophic microbes. Molecular Plant-Microbe Interactions. 2007; 9: 1023–1030.
28. Heintz C, Blaich R. Ultrastructural and histochemical studies on interactions between *Vitis vinifera* L. and *Uncinula necator* (Schw.). Burr. New Phytologist. 1990; 115:107–117.
29. Hockelhoven R. Cell wall associated mechanisms of disease resistance and susceptibility. Annual Review of Phytopathology. 2007; 45:101–127
30. Iqbal J, Hasan M, Ashfaq M, Sahi ST, Ali A . Studies on correlation of *Amarasca biguttula biguttula* (Ishida) population with physio-morphic characters of okra, *Abelmoschus esculentus* (L.) Monech. Pak. J. of Zoology. 2011; 49(1):141-146.
31. Rubiales D, Niks RE. Avoidance of rust infection by some genotypes of *Hordeum chilense* due to their relative inability to induce the formation of appressoria. Physiological and Molecular Plant Pathology. 1996;49:89–101.
32. Shaik M. Race non-specific resistance in bean cultivars to races of Uromyces appendiculatus var. appendiculatus and its correlation with leaf epidermal characters. Phytopathology. 1985; 75:478–481.
33. Mishra MK. Stomatal characteristics at different ploidy levels in Coffea L. Annals of Botany. 1997; 80:689–692.
34. Felle HH, Herrmann A, Hanstein S, Huckelhoven R, Kogel KH.. Apoplastic pH signaling in barley leaves attacked by powdery mildew fungus Blumeria graminis f.sp. hordei. Molecular PlantMicrobe Interactions. 2004; 17:118–123.

https://doi.org/10.5281/zenodo.7939581