Biological Forum – An International Journal **14(1): 1412-1415(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Screening of Cumin (*Cuminum cyminum* L.) Germplasm to Blight and Wilt Diseases caused by *Alternaria burnsii* and *Fusarium oxysporium* f. sp. *Cumini*

G.L. Kumawat[1*], A.C. Shivran[1], Ram Kunwar[1], S.S. Punia[1] and Jitendra Singh[2]
[1]ICAR-All India Coordinated Research Project on Spices,
Sri Karan Narendra Agriculture University, Jobner (Rajasthan), India.
[2]Department of Plant Pathology, Sri Karan Narendra Agriculture University, Jobner (Rajasthan), India.

(Corresponding author: G.L. Kumawat)*
(Received 20 November 2021, Accepted 08 February, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Cumin is one of the most valuable crop specially for the arid region farmers. Cumin seeds have a typical pleasant aroma due to an aromatic alcohol, amino and spicy taste. It is largely used as condiment and an essential ingredient in all mixed spices and carries powers. Cumin faced many challenges in production is affected by diseases which are responsible for heavy yield losses. Among this blight caused by *Alternaria burnsii* and powdery mildew incited by *Erysiphe polygoni* are important and serious diseases observed to be cause significant losses in grain quantity as well as quality. Continuous efforts were made from time to time to screen and select resistant genotypes of cumin against the blight and wilt diseases. Since host plant, resistance is an effective, economic and environmentally safe component in an integrated approach to keep plant diseases below the threshold level. Seventy eight (78) cumin germplasm/lines were screened for their resistance to blight and wilt diseases in natural as well as artificial conditions. None of the genotypes found totally resistant to either blight or wilt diseases. UC-220, UC-234, UC-239, UC-245, UC-285, UC-290, UC-291, UC-294, UC-299, UC-318, UC-322, UC-325, UC-326, UC-330, UC-331, UC-333, UC-335, UC-339, UC-341, UC-347 and UC-348 germplasm/lines found moderately resistance (range of disease incidence 21-40 percent) reaction against wilt disease and UC-223, UC-224, UC-234, UC-239, UC-247, UC-256, UC-258 to UC-260, UC-267, UC-270, UC-280, UC-291, UC-310, UC-326, UC-336, UC-341, UC-343 and UC-346 germplasm/lines found moderately resistance (range of disease severity 21-40 PDI) reaction against blight disease and rest of the genotypes showed susceptible and highly susceptible reactions against the wilt and blight diseases. Further studies of totally resistant germplasms/line are required to release for enhancement of better quality and production of cumin.

Keywords: Cumin, disease, blight, wilt, resistance, germplasm.

INTRODUCTION

Cumin (*Cuminum cyminum* L.) belongs to order Umbellales and family Apiaceae. Cumin is most popular aromatic and herbaceous plant having medicinal, pharmaceutical and nutraceutical properties (Allaq *et al*., 2020). It is an important dry land spices in Rajasthan and Gujarat. Cumin seeds have a typical pleasant aroma due to an aromatic alcohol, amino and spicy taste. It is largely used as condiment and an essential ingredient in all mixed spices and carries powers. Cumin is affected by a number of various diseases. Among this blight caused by *Alternaria burnsii* and wilt incited by *Fusarium oxysporium* f. sp. *Cumini* are important and serious diseases observed to be cause significant losses in grain quantity as well as quality. Wilt results in yield losses up to 35 per cent in cumin in some districts of Rajasthan (Vyas and Mathur 2002). The wilt affected plants turn yellow and latter show characteristics wilted symptoms. The blight disease involves all the aerial parts of the plant particularly the succulent leaves and blossom, which become completely blighted. When the infection occurs in the seed, the seeds are poorly formed, dark brown to black in colour, resulting in poor germination. Cloudy weather and warm-wet conditions after flowering increase the incidence of disease and spread in the whole field within a short period causing complete failure of the crop (Jadeja and Pipliya 2008). The disease severity varied from 16-65% causing serious damage to the crop (Kalpana, 1993). Continuous efforts were made from time to time to screen and select resistant genotypes of cumin against the blight and wilt diseases. Since host plant, resistance is an effective,

economic and environmentally safe component in an integrated approach to keep plant diseases below the threshold level.

MATERIAL AND METHODS

The field experiment was conducted in All India Coordinated Research Project on Spices at agriculture research farm, SKN College of Agriculture, SKN Agriculture University, Jobner, Rajasthan, India, for screening of blight and wilt. Seventy eight cumin genotypes were screened during crop season 2019-21 for their resistance to blight and wilt diseases in natural as well as artificial conditions. The culture of *Alternaria burnsii* and *Fusarium oxysporum* f. sp. *cumini* were raised on sterilized sorghum seeds in 500 ml flasks for seven days. The inoculum was mixed with soil before sowing the seeds in plots (in one row plot of 3 × 0.3 sq. m. size and three replications). Seventy eight available cumin genotypes were screened for their disease resistance and susceptibility in terms of severity of disease symptoms. The seeds sown in plots, in which inoculum was not added served as control. The per cent wilt incidence to be calculated by following formula.

$$\text{Per cent disease incidence} = \frac{\text{Total number of wilted plants in plots}}{\text{Total number of plants in plots}} \times 100$$

The severity of Alternaria blight were recorded for three times starting from the sixty five days after sowing (DAS) of cumin seedlings at the interval of 10 days. For determining disease severity, ten plants were randomly selected from each plot and percent disease index (PDI) was calculated (Chester, 1959; Wheeler, 1969).

$$\text{PDI of Blight} = \frac{\text{Sum of all disease rating}}{\text{Total no. of plants assessed} \times \text{Maximum possible rating}} \times 100$$

The disease intensity was calculated with the help of disease rating scale (0–5) where, (0 = Free from disease, 1 = 1–10% area of leaf & umbel blighted, 2 = 11–20% area of leaf, stem & umbel blighted, 3 = 21–35% area of leaf, stem & umbel blighted, 4 = 36–60% area of leaf, stem & umbel blighted and 5 = More than 60% area of leaf, stem & umbel blighted (Jat, 2015).

RESULTS AND DISCUSSION

The results presented in Table 1 revealed that out of seventy eight genotypes screened none were found no disease or totally resistant to either blight or wilt. Maximum resistance (MR) to blight was observed in nineteen (19) genotypes *i.e.* UC-223, UC-224, UC-234, UC-239, UC-247, UC-256, UC-258 to UC-260, UC-267, UC-270, UC-280, UC-291, UC-310, UC-326, UC-336, UC-341, UC-343 and UC-346. Maximum susceptibility (HS) to blight was observed in twelve (12) genotypes *i.e* UC-228, UC-229, UC-243, UC-282, UC-296, UC-299, UC-321, UC-329, UC-342, RZ-209, RZ-223 and Jobner local and forty seven (47) genotypes were susceptible. Maximum resistance (MR) to wilt was shown by twenty one (21) genotypes *i.e* UC-220, UC-234, UC-239, UC-245, UC-285, UC-290, UC-291, UC-294, UC-299, UC-318, UC-322, UC-325, UC-326, UC-330, UC-331, UC-333, UC-335, UC-339, UC-341, UC-347 and UC-348. Maximum susceptibility (HS) to wilt was shown by eighteen (18) genotypes *i.e* UC-224, UC-228, UC-231, UC-236, UC-256, UC-260, UC-270, UC-274, UC-276, UC-289, UC-298, UC-334, UC-338, UC-340, UC-342, UC-346, RZ-19 and Jobner local and thirty nine (39) genotypes were found susceptible. In our present investigation none of the genotypes showed complete resistance to either blight or wilt disease of cumin. These findings are in conformity with the previous findings (Mehta and Solanki, 1990; Bhatnagar, 1992; Yadav, 2003; Deepak, *et al*., 2004; Deepak and Patni, 2004; Arora *et al.*, 2004, Deepak *et al.*, 2008; Talaviya, *et al*., 2017).

Table 1: Screening of different genotypes against cumin wilt and blight diseases.

Sr. No.	Genotypes	Wilt (%)	Blight (PDI)	Disease reaction		Sr. No.	Genotypes	Wilt (%)	Blight (PDI)	Disease reaction	
				Wilt	Blight					Wilt	Blight
1.	UC – 217	40.5	52	S	S	40.	UC – 293	42.0	46.0	S	S
2.	UC – 220	32.0	47.6	MR	S	41.	UC – 294	37.2	49.0	MR	S
3.	UC – 223	48.0	37.6	S	MR	42.	UC – 295	41.5	41.0	S	S
4.	UC – 224	60.6	33.0	HS	MR	43.	UC – 296	49.0	63.0	S	HS
5.	UC – 225	42.8	44.6	S	S	44.	UC – 298	63.0	52.0	HS	S
6.	UC – 228	61.0	66.4	HS	HS	45.	UC – 299	40.0	60.4	MR	HS
7.	UC – 229	49.5	60.8	S	HS	46.	UC – 300	46.0	41.0	S	S
8.	UC – 231	64.8	45.0	HS	S	47.	UC – 309	48.5	52.0	S	S
9.	UC – 232	59.5	42.0	S	S	48.	UC – 310	40.6	36.2	S	MR
10.	UC – 234	38.0	35.0	MR	MR	49.	UC – 318	36.0	45.0	MR	S
11.	UC – 236	65.6	42.0	HS	S	50.	UC – 319	42.0	46.0	S	S
12.	UC – 239	40.0	35.0	MR	MR	51.	UC – 321	55.0	62.0	S	HS

13.	UC – 240	42.2	40.0	S	S	52.	UC – 322	40.0	47.0	MR	S
14.	UC – 243	46.5	61.0	S	HS	53.	UC – 323	45.5	41.0	S	S
15.	UC – 245	39.0	55.0	MR	S	54.	UC – 325	39.0	49.0	MR	S
16.	UC – 247	53.5	40.0	S	MR	55.	UC – 326	38.2	38.0	MR	MR
17.	UC – 254	50.0	41.0	S	S	56.	UC – 327	45.0	42.0	S	S
18.	UC – 256	61.4	40.0	HS	MR	57.	UC – 329	41.8	65.4	S	HS
19.	UC – 258	42.5	38.0	S	MR	58.	UC – 330	37.0	48.0	MR	S
20.	UC – 259	50.3	37.0	S	MR	59.	UC – 331	34.5	45.0	MR	S
21.	UC – 260	60.2	39.0	HS	MR	60.	UC – 332	49.0	52.0	S	S
22.	UC – 263	40.8	48.0	S	S	61.	UC – 333	32.5	41.0	MR	S
23.	UC – 267	46.0	35.0	S	MR	62.	UC – 334	62.5	43.0	HS	S
24.	UC – 268	40.2	41.0	S	S	63.	UC – 335	39.5	50.0	MR	S
25.	UC – 270	62.0	39.0	HS	MR	64.	UC – 336	40.2	40.0	S	MR
26.	UC – 271	52.0	50.0	S	S	65.	UC – 338	66.5	49.0	HS	S
27.	UC – 273	53.0	41.0	S	S	66.	UC – 339	34.0	53.0	MR	S
28.	UC – 274	60.2	48.0	HS	S	67.	UC – 340	62.0	50.0	HS	S
29.	UC – 276	62.4	45.0	HS	S	68.	UC – 341	38.2	34.5	MR	MR
30.	UC – 277	41.0	50.0	S	S	69.	UC – 342	65.0	61.0	HS	HS
31.	UC – 280	49.5	40.0	S	MR	70.	UC – 343	42.0	40.0	S	MR
32.	UC – 281	40.5	47.0	S	S	71.	UC – 344	41.0	44.6	S	S
33.	UC – 282	49.0	61.0	S	HS	72.	UC – 346	61.0	35.0	HS	MR
34.	UC – 285	35.0	42.0	MR	S	73.	UC – 347	38.5	45.0	MR	S
35.	UC – 286	40.2	46.0	S	S	74.	UC – 348	38.5	42.0	MR	S
36.	UC – 287	50.0	43.0	S	S	75.	RZ-19 (C)	60.8	51.4	HS	S
37.	UC – 289	65.1	45.0	HS	S	76.	RZ-209(C)	47.2	72.0	S	HS
38.	UC – 290	38.5	52.0	MR	S	77.	RZ-223(C)	42.8	63.8	S	HS
39.	UC – 291	39.6	40.0	MR	MR	78.	Jobner local (C)	74.6	82.2	HS	HS

Note: R-Resistant, MR- Moderately Resistant, S-Susceptible, HS-Highly Susceptible and C-Check

CONCLUSION

Twenty one (21) germplasm/lines found moderately resistance against wilt disease and nineteen (19) germplasm/lines found moderately resistance against blight disease and rest of the germplasm/lines showed susceptible and highly susceptible reactions against the wilt and blight diseases under present investigation.

FUTURE SCOPE

The identified germplasm lines resistance against blight and wilt diseases in the present study can be subjected to use in the future breeding programmes to develop resistant cultivars.

Acknowledgements. The present study was carried out under All India Coordinated Research Project on Spices supported by ICAR. The authors are thankful to the Director (ICAR-Indian Institute of Spices Research, Kozhikode, Kerala) and Project Coordinator for providing necessary support.

Conflict of Interest. None.

REFERENCES

Allaq, A. A., Sidik, N. J., Aziz, A. A and Ahmed, I. A (2020). Cumin (*Cuminum cyminum* L.): A review of its ethnopharmacology, phytochemistry. *Biomedical Research and Therapy*, *7*(9): 4016-4021.

Arora, D. K., Yadav, P., Kumar, D., & Patni V. (2004). Evaluation of cumin varieties for resistance to blight and wilt diseases. *Journal of Mycology and Plant Pathology*, *34*: 622-623.

Bhatnagar, K. (1992). Investigation in the blight of cumin caused by *Alternaria burnsii* in Rajasthan with special emphasis on its management. Ph.D. Thesis, Rajasthan University, Jaipur.

Chester, K. S. (1959). How sick the plant? *In*: Plant Pathology an advanced treatise (Eds. J.G. Horshfall and A.E. Diamond). Academic Press, New York. *1*, 199-242.

Deepak, Arora, D. K. and Kant, U. (2004). Screening of cumin varieties for resistance against *Alternaria burnsii* and *Fusarium oxysporum* f. sp. *cumini. J. Phytol. Res., 17*(l): 85-87.

Deepak and Patni (2004). Role of seed and soil in perennation of the blight and wilt disease of cumin (*Cuminum cyminum* L.) caused by *Alternaria burnsii* and *Fusarium oxysporum* f. sp. *cumini*. *Journal of Phytological Research*, *17*(1): 75-79.

Deepak, P., Arora, D. K., Saran, P. L. & Lal, G. (2008). Evaluation of Cumin Varieties against Blight and Wilt diseases with time of sowing. *Annals of Plant Protection Sciences*, *16*(2): 441-443.

Jadeja, K. B. & B. H. Pipliya (2008). In vitro evaluation of plant extracts and bioagents against *Alternaria burnsii* Uppal, Patel & Kamat causing blight of cumin (*Cuminum cyminum* L.). *Journal of Spices and Aromatic Crops*, *17*(1): 26–28.

Jat, V. D. (2015). Effect of Culture Filtrate of Blight Pathogen [*Alternaria alternata* (Fr.) Keissler] on Coriander and its Management. M. Sc. thesis, Sri Karan Narendra Agriculture University, Jobner, India.

Kalpana (1993). Investigation into blight of cumin (*Cuminum cyminum* L.) caused by *Alternaria burnsii* in Rajasthan with special emphasis on its management. Ph.D. thesis. University of Rajasthan, Jaipur, Indian.

Mehta, K. G. & Solanki, V. A. (1990). A status report on Plant Pathological work carried out on of main spices. Research Station, Jagudan, Dist. Mehsaha.

Talaviya, J. R., Kapadia, I. B., Bhalia, C. M. & Lathiya, S. V. (2017). Screening of cumin varieties/ lines against wilt disease. *Int. J. Curr. Microbiol. App. Sci.*, *6*(6): 3173-3176.

Vyas, R. K. & Mathur, K. (2002). Distribution of *Trichoderma* spp. in cumin rhizosphere and their potential in suppression of wilt. *Indian Phytopathology*, *55*(4): 451-457.

Wheeler, B. E. J. (1969). An introduction of plant diseases. John Willy & Sons Ltd., London. pp. 301.

Yadav, P. (2003). In vivo and in vitro studies of some important fungal diseases of cumin. Ph.D. Thesis. University of Rajasthan, Jaipur.

How to cite this article: G.L. Kumawat, A.C. Shivran, Ram Kunwar, S.S. Punia and Jitendra Singh (2022). Screening of Cumin (*Cuminum cyminum* L.) Germplasm to Blight and Wilt Diseases caused by *Alternaria burnsii* and *Fusarium oxysporium* f. sp. *Cumini*. *Biological Forum – An International Journal*, *14*(1): 1412-1415.