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Screening of Cucumber Germplasm against Economically Important Diseases under Open Field and Mid-Hill Conditions of Himachal Pradesh

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Abstract Diseases are the major limiting factor for profitable cucumber cultivation. As because cucumber is grown mainly as spring-summer and rainy season crop under open field condition in different parts of India, the active crop growth period coincides with the pre-monsoon or monsoon rains and the prevailing warm and humid conditions favor the foliar diseases. Therefore, thirty indigenous genotypes of cucumber genotypes were evaluated for their response towards angular leaf spot, anthracnose, downy mildew and powdery mildew under open field conditions during *kharif* season of 2015. The analysis of variance revealed highly significant differences among all the genotypes for their response to the diseases. Minimum angular leaf spot severity (6.67%) was found in LC-9, LC-10, LC-20 and LC-21, while LC-21 also recorded minimum anthracnose severity (3.33%). Further, the severity of downy mildew was minimum (11.33%) on LC-10 and severity of powdery mildew was minimum (4.00%) on both LC-10 and LC-20.

Keywords Cucumber, Angular leaf spot, Anthracnose, Downy mildew, Powdery mildew.

Introduction

Cucumber (*Cucumis sativus* L.) is regarded as second most widely cultivated cucurbit after watermelon. It is grown for its tender fruits which are consumed either as salad, cooked vegetable or as pickling cucumber at its immature stage. Diseases are the main limiting factor for profitable cucumber production in tropical and subtropical parts of the globe, including India.

Angular leaf spot, anthracnose, downy mildew and powdery mildew are the most serious and widespread diseases of cucumber. In Himachal Pradesh, most of the commercially cultivated cucumber varieties are susceptible to these diseases because the active growth period coincides with the advent of monsoon rain and the prevailing warm and humid weather favor the development of diseases. Although many simple cultural practices such as crop rotation and fall ploughing are employed, they are not much effective. The uses of commercially available chemicals are neither cost effective nor eco-friendly. Therefore, the most effective way to combat these diseases is the production of resistant varieties or hybrids. Therefore, the objective of this study was to screen avail

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Table 1. List of genotypes along with their sources and their response to the foliar diseases. SALNS–Severity of angular leaf spot, SANT-Severity of anthracnose, SDM-Severity of downy mildew, SPM-Severity of powdery mildew. *Figures in the parentheses are square root transformed, # Figures in the parentheses are Arc sine transformed.

Genotypes	Source	SANLS (%)*	SANT (%)*	SDM (%)#	SPM (%)*
LC-1	Jampur, Hooghly, WB	9.67 (3.26)	11.67 (3.55)	40.67 (39.60)	12.33 (3.65)
LC-2	Maheshwarpur, Hooghly, WB	7.33 (2.88)	5.33 (2.50)	19.33 (26.05)	5.00 (2.44)
LC-3	Sheoraphully, Hooghly, WB	9.33 (3.21)	11.33 (3.51)	34.00 (35.63)	12.00 (3.60)
LC-4	Champadanga, Hooghly, WB	11.00 (3.46)	12.00 (3.59)	38.00 (38.03)	13.67 (3.83)
LC-5	Bhanderhati, Hooghly, WB	16.00 (4.12)	13.67 (3.83)	45.33 (42.30)	14.33 (3.91)
LC-6	Sibaichandi, Hooghly, WB	12.67 (3.70)	12.33 (3.64)	40.67 (39.60)	15.00 (3.99)
LC-7	Harit, Hooghly, WB	9.00 (3.16)	11.00 (3.46)	38.00 (38.04)	9.67 (3.26)
LC-8	Gopalpur, Nadia, WB	10.00 (3.31)	13.00 (3.74)	32.67 (34.84)	14.67 (3.95)
LC-9	Simurali, Nadia, WB	6.67 (2.76)	7.67 (2.93)	26.67 (31.08)	11.00 (3.46)
LC-10	Barasat, N-24 Parganas, WB	6.67 (2.75)	4.00 (2.29)	11.33 (19.50)	4.00 (2.22)
LC-11	Amtala, S-24, Parganas, WB	10.33 (3.37)	9.33 (3.21)	27.33 (31.50)	16.00 (4.12)
LC-12	Kamdebpur, N-24 Pgs, WB	18.33 (4.40)	16.67 (4.20)	49.33 (44.59)	17.67 (4.32)
LC-13	Memari, Burdwan, WB	9.33 (3.21)	10.00 (3.31)	34.00 (35.64)	11.00 (3.46)
LC-14	Diamond Harbour, S-24 Pgs, WB	9.00 (3.16)	8.67 (3.11)	38.67 (38.43)	10.00 (3.31)
LC-15	Paskura, West Medinipur, WB	14.00 (3.87)	12.00 (3.60)	38.00 (38.04)	15.00 (3.99)
LC-16	Uluberia, Howrah, WB	7.67 (2.94)	9.00 (3.15)	27.33 (31.49)	10.33 (3.36)
LC-17	Mangalbaria, Sikkim	20.33 (4.62)	18.33 (4.39)	57.33 (49.20)	20.33 (4.62)
LC-18	Allahabad, UP	12.33 (3.65)	15.67 (4.08)	59.33 (50.36)	19.00 (4.47)
LC-19	Varanasi, UP	9.00 (3.16)	13.00 (3.74)	26.00 (30.60)	15.00 (3.99)
LC-20	Hubli, Dharwad, KN	6.67 (2.76)	4.33 (2.31)	15.33 (23.03)	4.00 (2.22)
LC-21	Ettinagudda, Dharwad, KN	6.67 (2.76)	3.33 (2.08)	12.33 (20.49)	4.33 (2.29)
LC-22	Bhuira, Sirmour, HP	21.00 (4.69)	23.00 (4.93)	62.33 (52.13)	24.00 (4.99)
LC-23	Narag, Sirmour, HP	17.00 (4.24)	15.00 (3.99)	56.00 (48.43)	16.67 (4.20)
LC-24	Gohar, Mandi, HP	21.00 (4.69)	23.00 (4.93)	63.33 (52.71)	24.00 (4.99)
LC-25	Manali, Kullu, HP	14.00 (3.87)	16.00 (4.12)	45.33 (42.30)	18.00 (4.36)
LC-26	Sarkaghat, Mandi, HP	9.00 (3.16)	27.00 (5.29)	45.00 (53.12)	24.67 (5.07)
LC-27	Deothi, Solan, HP	7.00 (2.83)	10.67 (3.41)	29.33 (32.76)	9.67 (3.26)
LC-28	Joharji, Solan, HP	20.00 (4.58)	19.00 (4.47)	44.00 (41.54)	19.00 (4.47)
LC-29	Bhojnagar, Solan, HP	22.33 (4.83)	21.33 (4.72)	43.33 (41.15)	20.67 (4.65)
K-75	UHF, Nauni, Solan, HP	11.00 (3.46)	14.00 (3.87)	25.67 (30.26)	18.33 (4.40)
Mean	—	12.14 (3.56)	13.04 (3.66)	38.17 (37.76)	14.31 (3.83)
SE(d)±	—	0.14	0.18	1.32	0.16
CD (0.05)	—	0.28	0.36	2.65	0.31

able cucumber germplasm against economically important diseases under natural conditions.

Materials and Methods

The experiment was laid out in randomized complete block design with three replications at the Experimental Research Farm, Department of Vegetable Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh. The experimental material consisted of thirty indigenous genotypes of cucumber (Table 1) including a check K-75, which is a leading commercial public sector cucumber variety in Himachal Pradesh. Standard cultural practices were followed for raising healthy crop of cucumber [1]. Observations were recorded from ten leaves from each vine, five random vines in each replication. Data on severity of angular leaf spot were recorded on a modified 0—9 scale [2] and severity of anthracnose, downy mildew and powdery mildew was recorded on 0–5 scale [3]. The disease severity index (%) was calculated with the formula suggested by McKinney [4].

$$\text{Disease severity index} = \frac{\text{Sum of all disease ratings}}{\text{Total number of ratings} \times \text{maximum disease grade}} \times 100$$

The data recorded were subjected to analysis of variance as per procedure described by Gomez and Gomez [5]. The analysis of variance revealed highly significant differences among the genotypes for their response to all the four diseases studied.

Results and Discussion

Development of any disease is due to three-way interaction of the virulent pathogen, the susceptible host and the favorable environment, which is known as disease triangle. Therefore, it can be stated that resistance to a particular disease depends upon the three factors. Among these three, the pathogen load, the stage of crop growth and the duration of infection generally contribute more but favorable environment obviously play a role. Hence, variation of a disease severity on a particular genotype during a growing season depends on the prevailing temperature and relative humidity.

Analysis of variance showed highly significant difference in all the genotypes for the diseases studied (Table 1). Four genotypes viz. LC-9, LC-10, LC-20 and LC-21 had minimum severity of angular leaf spot (6.67%), which was statistically at par with that of LC-2, LC-16 and LC-27. Fifteen genotypes had lower angular leaf spot severity as compared to the standard check. Minimum severity of anthracnose (3.33%) was recorded in LC-21 followed by LC-10 and LC-20. Eighteen genotypes showed lesser anthracnose severity than the standard check. The severity of downy mildew was minimum (11.33%) in LC-10 which was statistically at par with that of LC-21. Four genotypes were superior in terms of downy mildew severity over the standard check. Both the genotypes LC-10 and LC-20 had minimum severity of powdery mildew (4.00%) which was statistically at par with that of LC-2 and LC-21. As compared to the standard check, twenty-two genotypes showed lesser severity to powdery mildew.

Considering the severity pattern and other field performances, the genotypes LC-9, LC-10, LC-20 and LC-21 can be used as a source of resistance to angular leaf spot, whereas, the genotypes viz. LC-10, LC-20 and LC-21 can act as source for anthracnose resistance. For incorporation of downy mildew resistance, LC-10 and LC-21 may be the option and for incorporation powdery mildew, LC-10 and LC-20 would suit. Among these genotypes, LC-10 had lesser severity to all the diseases, therefore can be used in combined breeding program.

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