

Prevalence of cumin diseases on farmer's field: A survey of Rajasthan and Gujarat states

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Abstract

To know the status of cumin diseases on farmers' fields, field survey was undertaken in the cumin-growing districts of Rajasthan and Gujarat from *rabi* 2007-08 to *rabi* 2011-12. The major cumin diseases observed were wilt (0-60%), blight (0-80%), and powdery mildew (0-54%) in moderate to severe form. Other diseases like phyllody and parasitic plant *Orobanche* were the emerging problems in cumin. Wilt and blight diseases were wide spread and occurred in Ajmer, Nagaur, Barmer, Jalore, Jodhpur, Jaisalmer, Pali, districts of Rajasthan and Banaskantha and Patan districts of Gujarat. Appearance of powdery mildew was observed in both the states in few districts. Phyllody was observed in Barmer, Jalore districts in traces. Few fields were also infested with parasitic plant *Orobanche* in Nagaur and Jodhpur districts of Rajasthan.

Key words : *Cuminum cyminum*, field survey, wilt, blight, powdery mildew

Introduction

Cumin (*Cuminum cyminum* L.) is an important seed spice crop and at world level, India ranks first in terms of the acreage and production. Within India, it is extensively cultivated in Rajasthan, Gujarat and in some parts of Madhya Pradesh as *rabi* crop. The climatic conditions found in the two states of Rajasthan and Gujarat are more favorable for cumin cultivation, these two states contributes more than 80% in National area and production status. Cumin crop is grown in October - November and harvested in March - April, it is only grown for seed purpose as a cash crop, and the seeds also bear very high export value. It is also used in food and beverages industry as spice and condiment.

Cumin is generally grown as a mono crop. The increasing population load and globalization has created high demand of cumin both in domestic and international markets. There is need to enhance the productivity levels to meet the increasing demand. The principal constrains to achieve high productivity are high yielding varieties, improper nutrient management and susceptibility of cumin to devastating diseases viz., *Fusarium* wilt, *Alternaria* blight and powdery mildew, which are the major yield reducing factors.

In cumin occurrence of diseases i.e. wilt, blight and powdery mildew along with improper nutrient management are the two major reasons for its low productivity (2). Emphasizing more on the biotic stresses, Agnihotri (1) and Dange *et al.* (2) reviewed the status of major, minor

and sporadic diseases of seed spices crops including cumin. Gaur (3) for the first time reported the existence of wilt disease in cumin caused by species of *Furasium* from Kekri in Ajmer district of Rajasthan state. During 1955-56, the disease was observed to be causing severe yield losses in the then Ajmer State (5). On the basis of the specificity of the wilt pathogen to its host, Patel *et al.* (8) identified the pathogen as *F. oxysporum* f.sp. *cumini*. The disease has been causing heavy losses in Gujarat and Rajasthan. In arid districts of Rajasthan, where cumin is extensively cultivated as a cash crop approximately 40% yield losses were recorded (6). *Alternaria* blight of cumin was first reported from Bombay Presidency by Uppal (9) and the causal organism was identified as *Alternaria burnsii* (11). During 1955 the disease caused heavy losses around Ajmer (4). The seed borne nature of pathogen was observed by Uppal *et al.* (11) and Patel and Desai (7). In India *Erysiphe polygoni* is the most important causative of powdery mildew diseases in seed spices including cumin (10)

Survey of the status of diseases in crops is essential to determine general levels of crop health, or the presence of particular diseases of quarantine significance, prioritization of problems to enable proper allocation of crop protection resources, and to assess the losses caused by crop diseases. In view of the changing farming systems and adoption of improved cumin cultivars, the disease situation too has changed in Rajasthan and Gujarat. Therefore, the present investigation was planned with an objective to know the status of major diseases of

cumin on farmer's field and also to observe occurrence of any new biotic problem with time in cumin.

Materials and methods

The survey was undertaken in the cumin-growing districts of Rajasthan and Gujarat during the *rabi* season of 2007-08 to 2011-12. During the survey, one cumin field was sampled approximately every 10 km along the road side, depending upon the cropping intensity. Diseases were recorded in each field in each of five quadrates. One quadrate was situated in each of four corners and one in the centre of the field. Disease samples were collected for isolation and identification of pathogens, and fields were assessed for incidence of major diseases of cumin. Stratified random samples were taken up in seven districts viz., Ajmer, Nagaur, Jodhpur, Barmer, Jalore, Jaisalmer and Pali of Rajasthan and two districts Banaskantha and Patan of Gujarat: Data were recorded for wilt, blight, powdery mildew and other diseases. Diseases incidence was recorded as percentage incidence in a field for wilt, while foliar diseases such as blight and powdery mildew were scored on 1-5 and 1-4 scale (where 1= absolutely free from disease, and 5 and 4 =>50% of the area infected). Other information like crop stage, cultivar, cropping sequence, pesticides application was also taken into consideration in each district. The details of on-farm survey of cumin diseases are given in table 1.

Results and discussion

The state wise and district wise distribution of cumin diseases on farmers' field are given in table 2. Apart from RZ 19 and GC 4 two popular varieties of cumin many

private sector varieties named as Avani-111, Dinkar, Chamatkar, Western C-60, DSPL Heera No.1, Sona-1, Sardar Utsav-44, Ganesh 55 were found to be popular among farmers. However, many farmers used their own seed (previous year seed) for cultivation of cumin. The major cumin diseases observed on farmer's field were wilt (0-60%), blight (0-80%), and powdery mildew (0-54%) in moderate to severe form. Prevalance of phyllody (Witches Broom) and *Orobanche* (parasitic plant) was also observed in few fields, these can be considered as the emerging problems in cumin.

A total of 217 fields of cumin were surveyed in 101 locations of seven districts of Rajasthan and two districts of Gujarat (Table 3). Cumin crop was in different stages of growth during the survey, ranging from flowering to grain maturity. In cumin crop occurrence of wilt, powdery mildew and blight diseases were observed in one or the other places surveyed during *rabi* 2007-08 to 2011-12 in moderate to severe form. The district wise prevalence of different diseases is depicted in table 2. Incidence of wilt caused by *Fusarium oxysporum* f.sp. *cumini* was evident in almost all fields of each village surveyed and varied from 0 to 60% with a mean incidence of 2.6 to 22.5% in different districts of Rajasthan and Gujarat (Table 3). Comparatively, more number of fields with wilt incidence was observed in Rajasthan as compared to Gujarat. The second highest incidence of diseases observed were blight caused by *Alternaria burnsii* on foliage where the disease PDI varied from 0 to 80% with a mean score of 2.8 to 33.6%. Powdery mildew caused by *Erysiphe polygoni* was observed in Ajmer, Nagaur, and Banaskantha

Table 1. Details of on-farm survey of cumin diseases (2007-2012)

Season	States	Districts	Crop stage
Rabi 2007-08	Rajasthan	Ajmer, Pali, Nagaur, Jodhpur, Barmer, Jalore	Flowering, dough
Rabi 2009-10	Rajasthan	Ajmer, Nagaur, Barmer, Jalore	Flowering, dough
	Gujarat	Banaskantha	Dough, maturity
Rabi 2010-11	Rajasthan	Ajmer, Jodhpur, Jaisalmer, Barmer, Jalore	Flowering, dough , maturity
	Gujarat	Banaskantha	Maturity
Rabi 2011-12	Rajasthan	Ajmer, Nagaur, Jodhpur, Jaisalmer, Barmer, Jalore, Pali	Flowering, dough
	Gujarat	Banaskantha, Patan	Flowering, dough

districts and its PDI ranged from 0 to 54% with mean score of 13.6-37.0%. It was observed that early- sown cumin matures early and escapes powdery mildew incidence. Incidence of blight was severe in most of fields surveyed during 2009-10 as compared to 2007-08 may be due to variation in the prevailing environmental conditions.

Apart from these, other phyto-pathogenic diseases were also observed in the scattered area. The yellowing disease i.e. yellowing of the plant parts initially and later seed become hollow and yellow green and later the whole plant dries. The affected seeds becomes watery and fragile, if the plants survive its seed remains hollow and light weight, which can be clearly differentiated from the healthy seed. The prevalence of these above mentioned yellowing symptoms were observed in only 25 % of farmer's fields of Ajmer, Nagaur, Pali and Jodhpur districts in low frequency. The disease was not observed in Barmer and Jalore districts in any of the field surveyed. In Jodhpur and Barmer districts, in few fields cumin plants showing

disease symptom resembled to the phytoplasma disease, phyllody were observed. In a very limited area of Jodhpur districts the crop was infested with parasitic plants like *Orobanche* and *Cuscuta*.

The information collected revealed that wilt and blight diseases were wide spread and occurred in Ajmer, Nagaur, Barmer, Jalore, Jodhpur, Jaisalmer, Pali, districts of Rajasthan and Banaskantha and Patan districts of Gujarat. Whereas, powdery mildew appearance was observed in few districts of both the states. Phyllody was observed in Barmer and Jalore districts in traces. Few fields were also infested with parasitic plant *Orobanche* in Nagaur and Jodhpur districts of Rajasthan. The two air born diseases powdery mildew and blight are highly weather dependent, hence prophylactic management strategy is very much needed to combat them. The emerging problems of phyllody, yellowing and *Orobanche* also need proper attention to understand the host-pathogen/plant interaction and its management strategy to check its spread in wide areas with time.

Table 2. Distribution of cumin diseases in different districts of Rajasthan and Gujarat surveyed during *rabi* season in 2007-08, 2009-10, 2010-11 and 2011-12

State	District	Cultivars grown	Diseases identified
Rajasthan	Ajmer	GC 4, RZ 19, RZ 209, local	Wilt, Blight, Powdery mildew, Yellowing symptoms*
	Nagaur	RZ 19, local, Avani – 111, Dinkar, Chamatkar,	Wilt, Blight, Powdery mildew, <i>Orobanche</i> (parasitic plant), Yellowing symptoms*
	Barmer	GC 4, Western-60, SAI-17, local	Wilt, Blight, Phyllody
	Jalore	Western-60, GC-4, Avani 111, RZ 223, local	Wilt, Blight, Phyllody
	Pali	RZ 19, Avani-111, Local	Wilt, Blight, Yellowing symptoms*
	Jodhpur	RZ 209, GC 4, Avani-111, Western-60, local, Heera No.1, Sona-1, Sardar Utsav-44	Wilt, Powdery mildew, Phyllody, <i>Orobanche</i> (parasitic plant), Yellowing symptoms*
	Jaisalmer	RZ 209, GC 4, Avani-111, Western-60, local	Wilt, Blight
Gujarat	Banaskantha	GC 4	Blight, Powdery mildew
	Patan	GC 4, Ganesh 55	Wilt, Blight

Table 3. Prevalence of major cumin diseases in different districts of Rajasthan and Gujarat (Rabi 2007-2008 to 2011-12)

State	District	Locations	No. of fields	Wilt (%)		Blight (%)		Powdery mildew (%)	
				Mean	Range	Mean	Range	Mean	Range
Rajasthan	Ajmer	15	43	7.2	1.7-21.4	28.5	0-70	16.3	3.7-46
	Nagaur	15	22	8.0	0-9.2	19.1	0-70	-	-
	Jodhpur	15	35	7.6	0-13	19.6	0-40	13.6	0-27.5
	Jaisalmer	11	26	7.5	0-34	27.0	0-80	-	-
	Barmer	14	52	4.4	0-35	33.6	0-70	-	-
	Jalore	15	17	12.7	5-28	27.0	0-54	-	-
	Pali	7	8	22.5	0-60	2.8	0-10	-	-
Gujarat	Banaskantha	7	7	-	-	24.2	14-34	37.0	20-54
	Patan	2	7	2.6	0-16	0.7	0-5.4	-	-

References

1. Agnihotri, J. P. 1991. Diseases of arid zone seed spices: present status and future strategies for their management. *In Dryland Resources and Technology*: 1-40.
2. Dange, S. R. S., Pandey, R. N. and Savalia, R. L. 1992. Diseases of cumin and their management - A review. *Agricultural Reviews* **13**: 219-224.
3. Gaur, M. M. 1949. Plant protection work in Ajmer-Merwara in 1948 Plant Diseases. *Plant Protection Bulletin Govt. of India* **1**:20-21.
4. Joshi, N. C. 1955. Notes on two diseases of *Cuminum cyminum* L. hitherto unreported from Ajmer State. *Science & Culture* **21**: 101-102.
5. Joshi, N. C. and Agnihotri, J. P. 1958. Studies on the wilt disease of cumin (*Cuminum cyminum* L.) in Ajmer State. *India Lloydia [Cincinnati]* **21**: 29-33.
6. Lodha, S., Gupta, G. K. and Singh, S. 1986. Crop disease situation and new records in Indian arid zone. *Annals of Arid Zone* **25**: 311-320.
7. Patel, R. M. and Desai, M. V. 1971. *Alternaria burnsii* Blight of *Cuminum cyminum* and its control. *Indian Phytopathology* **24**: 16-22.
8. Patel, P. N., Prasad, N., Mathur, R. L. and Mathur, B. L. 1957. Fusarium wilt of cumin. *Current Science* **26**: 181-182.
9. Uppal, B. N. 1930. Macrosporium blight of *Cuminum cyminum* in the Bombay Presidency. *Internal Inst Agric Internal Bull Plant Protect* **4**.
10. Uppal, B. N. and Desai, M. K. 1933. Cumin powdery mildew in Bombay. *Bombay Dept Agric Bull* **169**: 1-16.
11. Uppal, B. N., Patel, M. K. and Kamat M. N. 1938. *Alternaria* blight of cumin. *Indian Journal of Agricultural Sciences* **8**: 49-62.

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