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Management of blight and powdery mildew diseases of cumin by spacing and potash application

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Abstract

Alternaria blight and powdery mildews are destructive diseases of cumin which may cause complete failure of crop if proper and timely precautionary measures are not taken. For the effective and economical management of cumin blight and powdery mildew, field experiments were conducted during *rabi* season of 2012-13, 2013-14, 2014-15 and 2015-16 with three levels, each of spacing and potash in split plot design. The minimum blight PDI was observed at row spacing of 45 cm × 10 cm and 30 cm × 10 cm row spacing as compared to broadcasting method except in the year of 2015-16. Further blight intensity was decreased with the increased dose of potash application from 0 to 20 kg/ha in general but significant reduction was observed up to 10 Kg k_2O ha^{-1}. In case of powdery mildew, the crop sown at 30 cm x 10 cm and 45 cm × 10 cm were found at par and recorded significantly lower powdery mildew intensity as compared to broadcasting while effect of potash application was not found significant. The differences in seed yield with 45 cm × 10 cm and 30 cm × 10 cm were non-significant but recorded significantly higher seed yield as compared to broadcasting. Significantly higher seed yield of cumin was recorded with the application of 20 kg K_2O ha^{-1} and 10 kg K_2O ha^{-1} over control (without potash application).

Key words : Blight, cumin, potash, powdery mildew, spacing

Introduction

Cumin (*Cuminum cyminum* L.) is grown in India besides several other countries like Bulgaria, Egypt, Argentina, Turkey, Bangladesh, Iran, China, Italy, Pakistan *etc*. It is an important low volume high value seed spice crop. Rajasthan and Gujarat contributes more than 80 per cent national production of cumin in India. In the year 2014-15, cumin was grown in 8.59 lakh hectares with the production of 5.14 lakh tones and productivity of 0.6 tones per hectare in India (http://www.spicesboard.in/). The area under the crop has increased in recent past. It is exported to many countries including Bangladesh, Japan, Malaysia, Nepal, Pakistan, Singapore, USA *etc*. The value added products, oils and oleoresins are exported to USA, UK, and Germany *etc*. Cumin seeds contain 2.5-4.0% volatile oil and cuminol which is needed in pharmaceutical industries. The crop is affected by many pathogens causing diseases which negatively influence the seed yield (Dange,1995 and Sharma *et al.*, 2010). In Rajasthan and Gujarat, the major cumin diseases observed on farmer's field are wilt (*Fusarium oxysporum f.sp. cumini*), blight (*Aternaria burnsii*) and powdery mildew (*Erysiphe polygoni*) in moderate to severe form (Sharma *et. al.*, 2013). Blight (*Aternaria burnsii*) is the major disease of cumin and reported first in Gujarat by Uppal *et al.*, (1938) in which small necrotic spots develop on all the aerial parts which enlarge, coalesce and turn brown to black and cause the loss in yield up to 80 per cent in absence of any effective control measures. The powdery mildew disease caused by *Erysiphe polygoni* DC reduced seed yield up to 50 per cent under favourable weather conditions. Under severe disease condition, the total failure of the crop has been observed (Champawat and Singh, 2008). Cumin is an export oriented commodity. Presence of chemical residues may reduce the export potential, therefore, use of non-conventional method to manage the diseases promote the export. Potash application and spacing may play a vital role in disease management in cumin. Keeping this in view, to quantify the dose of potash and ideal spacing level to combat the diseases in cumin, an experiment on management of blight and powdery mildew diseases in cumin by spacing and potash application was planned.

Materials and methods

A field experiment was conducted on loamy soil during *rabi* 2012-13 to 2015-16 at Seed Spices Research Station, S.D.Agril.University, Jagudan in a split plot design with four replications. Cumin cv. Gujarat Cumin-4 (GC-4) was sown during first fortnight of November. Nine treatment combinations comprising three levels each spacing

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Viz., S_1: Broadcasting, S_2 : 30.0 cm X 10.0 cm and S_3: 45.0 cm X 10.0 cm as main plot and potash i.e., K_0 : 0 kg ha^{-1}, K_1: 10 kg ha^{-1} and K_2: 20 kg ha^{-1} as sub plot with four replications. Recommended cultural practices were performed as per need of crop. The observation on the disease intensity was recorded on 20 randomly selected plants from each plot by using 0-5 scale in case of blight and 0-4 scale in case of powdery mildew as given below (Anon., 2004).

Cumin blight

0=No incidence / Healthy

1=Leaf tips only showing brightening symptoms

2=Majority of leaves showing blight

3=Blight symptoms on leaf & umbellate

4=Blight symptoms on leaf + few lesions on stem

5=Leaves, umbellate, stem and seed showing the blight symptoms

Cumin powdery mildew

0=No incidence / Healthy

1=Whitish small spots only on leaf

2=Whole leaf covered with whitish growth

3=Leaf and stem covered with whitish growth

4=Leaf, stem, umbellate and seeds covered with whitish growth

Based on these observations, PDI was calculated by using following formula given by Mckinney (1923).

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total plants examined} \times \text{Maximum rating}} \times 100$$

The seed yield from individual plots were also recorded and converted to per hectare basis.

Results and discussion

The minimum blight intensity was observed at row spacing of 45 cm x 10 cm and it was at par with 30 cm x 10 cm row spacing but significantly superior over broadcasting except in the year of 2015-16.This might be due to reduction in humidity of microclimate due to wider spacing.

Blight intensity in general decreased with increase in potash application from 0 to 20 kg ha^{-1} but, significant reduction was observed up to 10 kg k_2O ha^{-1} during 2012-

Table 1: Effect of spacing and application of potash on blight and powdery mildew diseases of cumin

Treatments	Blight (PDI)				Powdery mildew (PDI)		
	2012-13	2013-14	2015-16	Pooled	2013-14	2015-16	Pooled
A. Main plot : Spacing							
S_1 : Broadcasting	54.21 (64.92)*	57.70 (69.69)*	38.70 (38.67)*	50.20 (57.76)*	21.59 (13.20)*	26.04 (18.92) *	23.82 (16.6)*
S_2 : 30.0 cm X 10.0 cm	41.31 (43.19)	48.68 (55.79)	36.32 (34.67)	42.10 (44.55)	20.25 (11.51)	24.20 (16.42)	22.23 (13.97)
S_3 : 45.0 cm X 10.0 cm	39.56 (40.21)	41.00 (42.67)	34.12 (31.00)	38.23 (37.96)	19.41 (10.57)	23.56 (15.58)	21.48 (13.08)
S.Em	2.57	2.12	0.53	2.13	0.49	0.86	0.50
C.D.at 5 %	8.90	7.57	1.83	8.34	NS	NS	1.53
C.V %	19.78	15.43	5.04	15.71	8.34	12.11	10.78
B. Sub plot : Dose of potash							
K_0 : 0 Kg/ha	48.50 (55.27)	49.68 (57.39)	37.72 (37.08)	45.30 (49.25)	20.89 (12.36)	25.52 (18.17)	23.21 (15.27)
K_1 : 10 Kg/ha	43.34 (46.57)	49.45 (56.67)	35.98 (34.08)	42.92 (45.77)	20.23 (11.52)	24.24 (16.50)	22.24 (14.01)
K_2 : 20 Kg/ha	43.25 (46.48)	48.25 (54.09)	35.43 (33.17)	42.31 (44.58)	20.13 (11.39)	24.04 (16.25)	22.09 (13.82)
S.Em	1.37	1.57	0.76	0.74	0.51	0.61	0.40
C.D.at 5 %	4.07	NS	NS	2.10	NS	NS	NS
S x K	NS	NS	NS	NS	NS	NS	NS
Y X S x K				NS			NS
C.V %	10.54	11.06	7.21	10.19	8.59	8.61	8.64

* Figures in the parenthesis are re-transformed values

** During 2014-15, 15.2 mm rainfall was received on 02-03-2015 at maturity period of cumin which increased incidence of blight disease and crop was failure consequently experiment was vitiated.

13 and in pooled results (Table 1). These finding are in agreement with work done by Champawat and Pathak (1988).Potash developed the résistance in plant against disease which might be responsible for reduction of blight. The interaction effects of spacing and potash application on blight was non-significant.

Effect of spacing on intensity of powdery mildew was non significant during 2013-14 and 2015-16 but pooled results showed the significant effect. Crop sown at 30 cm x 10 cm and 45 cm x 10 cm found at par and recorded significantly lower powdery mildew intensity as compared to sowing through broadcasting. Similar findings were also reported by Patel (2011). Effect of potash application was not significant on powdery mildew intensity. However, application of potash was found beneficial for reducing the intensity of powdery mildew (Table 2). The interaction effects of spacing and potash application on powdery mildew was non-significant. These results are in line with Anonymous (1998).

Effect of spacing on seed yield of cumin was significant. During 2013-14 and 2015-16, seed yield of cumin increased significantly with each increase in spacing levels from broadcasting to 45 cm x 10 cm. During 2012-13 and in pooled results, differences in seed yield due to 45 cm x 10 cm and 30 cm x 10 cm were non-significant but, these both spacing's recorded significantly higher seed yield over broadcasting. The interaction effects of spacing and potash application on seed yield of cumin was non-significant. Similar findings were also reported by Patel (2011). Increase in levels of potash application from 0 to 20 kg ha^{-1} increased seed yield during course of experiment and pooled data. The higher seed yield was recorded with application at 20 kg K_2O ha^{-1} and was at par with 10 kg K_2O ha^{-1} but, these both the levels produced significantly higher seed yield over control (0 Kg K_2O ha^{-1}) except in the year of 2015-16. Under broadcasting method of sowing the uniform plant distance between two plants was not maintained which might reduce aeration, interception of sunlight and transpiration of dew, ultimately resulting in increase of disease intensity. Whereas, in line sowing better exposure of plants to sunlight, passes the air easily and transpired the dew rapidly which developed microclimate free from humidity consequently intensity of diseases were lowered down and procured higher yield.

Thus, sowing of cumin at spacing of 30 cm x 10 cm and fertilized by 10 kg k_2O ha^{-1} along with RDF (40 + 15 kg NP ha^{-1}) save the crop from diseases *i.e.* blight and powdery mildew and increased the seed yield.

References

Anonymous,1998. Effects of Potassium on plant diseases. *Better crops.* 82(3):37-39.

Anonymous, 2004. Proceeding of the XVII Workshop of All India coordinated Research Project on Spices, held at 3-5 Feb., 2004, IISR, Calicut, pp. 61.

Table 2: Effect of spacing and potash application on seed yield and volatile oil of cumin

Treatments	Seed yield (Kg ha^{-1})				Volatile oil (%)*
	2012-13	2013-14	2015-16	Pooled	
A. Main plot : Spacing					
S_1 : Broadcasting	188	252	210	217	5.2
S_2 : 30.0 cm X 10.0 cm	407	309	260	325	5.3
S_3 : 45.0 cm X 10.0 cm	421	378	329	376	5.2
S.Em	15	8	7.0	28	-
C.D.at 5 %	52	29	24	110	-
C.V %	15.47	9.17	8.86	12.12	-
B. Sub plot : Dose of potash					
K_0 : 0 Kg/ha	282	287	245	271	5.2
K_1 : 10 Kg/ha	375	307	261	315	5.4
K_2 : 20 Kg/ha	359	345	292	332	5.5
S.Em	12	21	11	9	-
C.D.at 5 %	37	NS	32	25	-
S x K	S	NS	NS	NS	-
Y X S x K				NS	-
C.V %	12.66	22.96	14.14	17.32	-

* Mean of 2012-13 to 2015-16

Champawat, R.S. and Pathak, V.N. 1988. Role of nitrogen, phosphorus and potassium fertilizers and organic amendments in cumin (*Cuminum cyminum* L.) wilt incited by *Fusarium oxysporum* f. sp. cumini. *Indian J. Mycol. Plant Path*. 19: 178-183.

Champawat, R.S. and Singh, V. 2008. Seed Spices. *In Disease Management in Arid Land Crops. Eds.* Lodha,S., Mawar, R and Rathore, B. S. Scientific Publishers (India) Jodhpur, p.197- 232.

Dange, S.R.S. 1995. Diseases of cumin (*Cuminum cyminum* L.) and their management. *Journal of Spices and Aromatic Crops*. 4: 57-60.

Gemawat, P.D. and Prasad, N. 1972. Epidemiological studies on *Alternaria* blight of *Cuminum cymanium* L. *Indian J. Mycol. Pl. Pathol*. 2: 65-74 18.

http://www.spicesboard.in/

Mckinney, 1923. Influence of soil temperature and moisture on infection of wheat seedling by *H. sativum*. *J. Agric. Res.*, 26: 195-217.

Patel, N.R. 2011. Study on Powdery mildew of Cumin (*Cuminum cyminum* L.) caused by *Erysiphe polygoni* DC. and its management. A Ph.D. (Agri.) in Plant Pathology Thesis, S.D. Agricultural University, Sardar krushinagar, Gujarat.

Sharma, Y.K., Anwer, M.M., Saxena, S.N. and Kant, K. 2010. Getting disease free seed spices. *Indian Horticulture*. 55: 22-24.

Sharma, Y.K., Kant, K., Solanki, R.K. and Saxena, R.P. 2013. Prevalence of cumin diseases on farmer's field: A survey of Rajasthan and Gujarat states. *International J. Seed Spices*. 3: 46-49.

Singh, R.K., Meena, S.S. and Vashishtha, B.B. 2007. Medicinal properties of seed spices. National Research Centre on Seed Spices (ICAR), Ajmer. p.19-22.

Uppal, B.N., Patel, M.K. and Kamat, M. N. 1938. *Alternaria* blight of cumin. *Indian J. Agric. Sci*. 8: 49-62.

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