International J. Seed Spices 7(2), July 2017:82-86

Chemical management of cumin blight

N. R. Patel, A. M. Amin and A. U. Amin

Seed Spices Research Station, Sardarkrishinagar Dantiwada Agril. University, Jagudan (GUJARAT)

Abstract

In field experiment conducted at Seed spices Research Station, S. D. Agril. University, Jagudan (Gujarat) for the management of *Alternaria* blight of cumin in a randomized block design with four replications during *rabi* 2012-13 to 2015-16, ten fungicides with different concentrations were tested along with untreated control. Minimum per cent disease intensity of blight was recorded in treatment kresoxim-methyl 44.3SC @ 0.1% which was at par with treatment mancozeb 75WP @ 0.25%. Treatment Kresoxim methyl 44.3SC @ 0.1% also recorded significantly higher seed yield as compared to other treatments, however it was at par with mancozeb 75 WP @ 0.25%, difenoconazole 25 EC @ 0.025% and propiconazole 25EC @ 0.1%.

Key words : *Alternaria blight*, cumin, fungicide, disease, management

Introduction

Cumin (*Cuminum cyminum* L.) is grown in India besides several other countries *viz.*, Bulgaria, Egypt, Argentina, Turkey, Bangladesh, Iran, China, Italy, Pakistan *etc*. It is an important crop of Rajasthan and Gujarat and some adjoining states. In 2013-14, cumin was grown in 9.43 lakhs hectares and produced 5.98 lakhs tones with an average productivity of 0.63 tons per hectare in India. Whereas, in Gujarat cumin was grown in 4.55 lakhs hectares and produced 3.55 lakhs tones with an average productivity of 0.78 tons per hectare. The area under the crop is increasing as some nontraditional areas are coming under cumin cultivation. The main cumin growing areas are Rajasthan and Gujarat as well as parts of Madhya Pradesh and Uttar Pradesh. It is exported to many countries including Bangladesh, Japan, Malaysia, Nepal, Pakistan, Singapore, USA *etc*. The value added products of cumin *viz.*, oleoresins and oils are exported to USA, UK, and Germany etc. Cumin seeds contain 2.5-4.0% volatile oil, aldehydes, cuminol which attributes to its medicinal properties. The crop is suffering to many pathogens causing diseases which negatively influence the yield (Dange,1995 and Sharma *et al.*, 2010). The major cumin diseases observed on farmer's field were wilt (*Fusarium oxysporum f.sp. cumini*), blight (*Aternaria burnsii*), and powdery mildew (*Erysiphe polygoni* DC) in moderate to severe form in Gujarat and Rajasthan (Sharma *et al.*,2013). Blight (*Aternaria burnsii*) was reported first from Gujarat by Uppal *et al.,* (1938). Few fungicides were earlier tested by Akbari *et al.,* (1996), Solanki *et al.,* (1973), Dange *et al.,* (2012) and Sharma *et al.,* (2013) for the management of disease. But the disease is appears in epiphytotic condtions and still causing severe yield losses under favourable environmental conditions. Chemical pesticides residues on cumin seed is the one of the major bottle necks for the export promotion. Efficient management of blight with minimum residues is one of the important factors to boost up the cumin productivity and export potential. Recently developed new molecules of fungicides which are widely used by many famers without any scientific base need to be tested for the management of cumin blight and its residue levels on seed. Hence, present study was undertaken.

Material and methods

A field experiment was conducted in randomize block design with four replications during *rabi* 2012-13 to 2015-16 at Seed Spices Research Station, Jagudan (Gujarat). Cumin cv. Gujarat Cumin-4 (GC-4) was sown during first fortnight of November. The recommended seed rate (12 kg ha^{-1}), fertilizers (40:15:00 NPK kg ha^{-1}), spacing (30 cm row spacing) and other cultural practices were adopted. Ten fungicides in different concentrations were tested for their efficacy. Three sprays of each fungicide were applied at an interval of 10 days starting from 35 days after germination (DAG) of crop.

The observation on the intensity of blight disease of cumin was recorded from 20 plants randomly selected from each plot using 0-5 scale (Chester, 1950) as

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 plus few lesions on stem

*Corresponding author email: rchitra@tnau.ac.in

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

Based on observations recorded, percent disease intensity (PDI) of blight was worked out, seed yield from individual plots was also recorded and converted in per hectare basis.

Results and discussion

The results presented in Table 1, revealed that there was significant difference in per cent disease intensity (PDI) during 2012-13, 2013-14, 2014-15, 2015-16 and pooled data too. The minimum per cent disease intensity was observed in T_2 i.e. spraying of metiram 55% + pyraclostrobin 5WG @ 0.3% and was at par with treatments T_4 i.e. spraying of kresoxim-methyl 44.3SC @ 0.044 %, T_{10} i.e. spraying of mancozeb 75WP @ 0.25%, T_9 i.e. spraying of difenoconazole 25EC @ 0.025%, T_3 i.e. spraying of azoxystrobin 250SC @0.1%, T_5 i.e. spraying of captan 70% + hexaconazole 6% @ 0.25% and T_8 i.e. spraying of propiconazole 25EC @ 0.1%. But, these treatments were significantly inferior over rest of the treatments during the year 2012-13. In the year 2013-14, the PDI was minimum with treatment T_{10} i.e. spraying of mancozeb 75WP @ 0.25% and was at par with treatment T_4 i.e. spraying of kresoxim-methyl 44.3SC @ 0.044 % whereas, significantly minimum per cent disease intensity was recorded in treatment T_4 i.e. spraying of kresoxim-methyl 44.3SC @ 0.044 % and was at par with treatment T_{10} *i.e.* spraying of mancozeb 75WP @ 0.25% during 2014-15 and 2015-16. In pooled data, all the treatments except T_1 and T_6 were at par and produced significantly lower per cent disease intensity as compared to control. Thus, application of kresoxim-methyl 44.3SC @ 0.044 % found better for management of blight in cumin during the course of investigation. The results obtained in the present study can be corroborated with the findings of earlier workers (Mehta and Solaki, 1990, Dange,1995, Akbari *et al.*,1996 and Sharma *et al.*, 2013).

Effect of different treatments on cumin seed yield was found significant during all the year and pooled results also (Table 2). During the year 2012-13, spraying of mancozeb 75WP @ 0.25% recorded significantly higher seed yield over control and statistically near to equal with treatments T_4, T_9 and T_2 but, significantly superior over rest of the treatments. In 2013-14, treatment T_9 i.e. spraying of difenoconazole 25EC @ 0.025% recorded significantly the maximum seed yield and was at par with treatments T_4, T_{10} and T_8. Whereas, during 2015-16 treatment T_4 *i.e.* spraying of kresoxim-methyl 44.3SC @ 0.044 % recorded significantly higher yield over control which was at par with treatments T_{10}, T_9, T_2 and T_8. In pooled data, spraying of Kresoxim-Methyl 44.3 SC @ 0.044% registered the maximum yield and statistically near to equal with treatments T_{10}, T_9, T_2 and T_8 but significantly superior over rest of the treatments. Higher yield under these treatments might be due to good efficacy of these newer molecules of fungicides against blight (Table 2). Thus, spraying of kresoxim-methyl 44.3SC @ 0.044 % found effective fungicide not only for management of blight but, increase the seed yield too.

Higher volatile oil content of cumin seed was recorded in treatments T_2 and T_4 while higher test weight was recorded in treatments of T_4 and T_{10}. Reduced PDI might be due to vigorous growth, bold seed size and weight (Table 3). Thus, spraying of kresoxim-methyl 44.3SC @ 0.044% (T_4) improved the cumin seed quality.

Samples collected from different farmer fields and APMC market showed the high level of residues of mancozeb. Under this study, residues level of kresoxim-methyl 44.3 SC @ 0.044 % found below critical limit fix by various agencies, Thus, use of kresoxim-methyl 44.3SC instead of mancozeb will promote the export of cumin without affecting yield and quality of crop.

Spraying of kresoxim-methyl 44.3SC @ 0.044 % first at thirty five days after germination and subsequent two sprays at 10 days interval (T_4) was recorded the maximum seed yield and gross realization. Spraying of mancozeb 75WP @ 0.25% (T_{10}) recorded the maximum net realization and BCR which was closely followed by treatment T_4 (Table 3).

Conclusion

Three sprays of kresoxim- methyl 44.3SC @ 0.044 % are advocated (First spray at 35 days after germination and subsequent two spays at 10 days interval after first spray) for getting the maximum yield with minimum disease intensity of blight in cumin.

References

Akbari, L. F., Dhruj, I. U., Khandar, R. R. and Vaishnav, M. U. 1996. Management of cumin blight through fungicides. *Plant Dis. Res*.11:103-105.

Chester, K. S. 1950. Plant Disease losses, their appraisal and interpretation. *Plant Dis. Deptt. Suppl*. 193:190-362.

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

Dange, S. R. S., Patel, R. R., Patel, S. S. and Patel, K. K. 2012. Management of cumin blight by different spray schedules of mancozeb. *Agric. Sci. Digest*. 22(2):99-102.

Table 1. Effect of different fungicides on blight disease and seed yield of cumin

Sr No	Treatments	Blight (PDI)					Seed Yield (kg ha^{-1})			
		2012-13	2013-14	2014-15	2015-16	Pooled	2012-13	2013-14	2015-16	Pooled
T_1	Zineb 68% + hexaconazole 4% @ 0.2%	62.01* (75.25)	32.59 (32.14)	40.33 (41.89)	35.35 (33.50)	42.57 (45.70)	211	372	291	291
T_2	Metiram 55% + pyraclostrobin 5WG @ 0.3%	19.11 (11.31)	31.26 (28.92)	36.84 (35.97)	32.23 (28.50)	29.86 (25.68)	574	432	372	459
T_3	Azoxystrobin 25SC @0.1%	28.70 (24.00)	32.52 (28.63)	38.05 (37.99)	33.50 (30.50)	33.19 (30.28)	470	416	271	386
T_4	Kresoxim-methyl 44.3SC @0.044 %	20.18 (12.56)	23.70 (16.03)	30.03 (25.05)	27.39 (21.25)	25.33 (18.72)	618	578	421	539
T_5	Captan70% + hexaconazole 6% @ 0.25%	28.79 (23.83)	33.26 (28.96)	38.91 (39.21)	36.11 (34.75)	34.27 (31.64)	403	389	295	363
T_6	Mancozeb 35SC @ 0.25%	50.56 (57.75)	30.27 (25.32)	36.23 (34.94)	30.80 (26.25)	36.96 (36.07)	475	337	281	364
T_7	Chlorothalonil 75WP @0.15%	39.17 (37.81)	28.10 (22.46)	34.36 (31.66)	34.43 (32.00)	34.01 (31.03)	467	423	287	392
T_8	Propiconazole 25EC @ 0.1%	32.34 (28.65)	26.53 (20.19)	33.11 (29.84)	32.56 (29.00)	31.13 (26.92)	500	475	348	441
T_9	Difenoconazole 25EC @0.025%	28.44 (22.35)	24.79 (17.96)	32.38 (28.70)	32.39 (28.50)	29.50 (24.50)	599	586	373	519
T_{10}	Mancozeb 75WP @ 0.25%	26.62 (20.25)	22.52 (14.36)	30.65 (26.02)	29.80 (24.50)	27.40 (21.28)	624	574	397	532
T_{11}	Untreated Control	72.73 (90.35)	43.51 (47.04)	48.95 (56.87)	44.57 (49.25)	52.44 (60.88)	177	222	219	206
	C.D at 5%	13.74	3.10	2.10	3.10	10.26	76	151	91	103
	C.V%	25.62	7.17	3.99	6.41	14.74	11.3	24.0	19.6	18.8

* Figures in the parenthesis are original values of arcsine transformation of PDI

During 2014-15, yield data was not consider due unseasonal rain after seed setting and maturing stage of crop

Table 2. Effect of different fungicides on 1000 seed wt.(g) and volatile oil (%) of cumin

Sr. No.	Treatments	1000 seed wt. (g)				Volatile oil content (%)			
		2012-13	2013-14	2015-16	Average	2012-13	2013-14	2015-16	Average
T_1	Zineb 68% + hexaconazole 4% @ 0.2%	3.12	4.78	3.70	3.87	4.20	4.55	3.95	4.23
T_2	Metiram 55% + pyraclostrobin 5WG @ 0.3%	3.56	4.65	4.00	4.07	5.60	4.50	3.70	4.60
T_3	Azoxystrobin 250SC @0.1%	3.53	4.29	3.75	3.86	4.50	4.70	3.80	4.33
T_4	Kresoxim-methyl 44.3SC @0.044 %	3.62	4.30	4.50	4.14	4.50	4.65	4.50	4.55
T_5	Captan70% + hexaconazole 6% @ 0.25%	3.50	4.70	3.90	4.03	5.00	4.70	3.90	4.53
T_6	Mancozeb 35SC @ 0.25%	3.69	4.62	4.05	4.12	4.80	4.75	4.00	4.52
T_7	Chlorothalonil 75WP @0.15%	3.47	4.82	4.00	4.10	5.20	4.60	3.70	4.50
T_8	Propiconazole 25EC @ 0.1%	3.57	4.74	3.90	4.07	4.60	4.80	4.00	4.47
T_9	Difenoconazole 25EC @0.025%	3.48	4.63	4.00	4.04	5.00	4.80	3.80	4.53
T_{10}	Mancozeb 75WP @ 0.25%	3.63	4.83	3.95	4.14	4.80	4.55	4.20	4.52
T_{11}	Untreated Control	2.30	3.97	3.70	3.32	3.80	4.30	3.50	3.87

* During 2014-15, data was not consider due unseasonal rain after seed setting and maturing stage of crop

Table 3. Economics of different treatments (based on pooled data)

Sr. No.	Treatment details	Yield Kg ha^{-1}	Gross Realiz-ation (`)	Cost of Inputs*	Net Realiz-ation (`)	BCR
T_1	Zineb 68% + hexaconazole 4% @ 0.2%	291	58200	29340	28850	0.98
T_2	Metiram 55% + pyraclostrobin 5WG @ 0.3%	459	91800	37000	54800	1.48
T_3	Azoxystrobin 250SC @0.1%	386	77200	29530	47670	1.61
T_4	Kresoxim-methyl 44.3SC @ 0.044 %	539	107800	33000	74200	2.27
T_5	Captan70% + hexaconazole 6% @ 0.25%	363	72600	30960	41640	1.34
T_6	Mancozeb 35SC @ 0.25%	364	72800	30900	41910	1.36
T_7	Chlorothalonil 75WP @0.15%	392	78400	28890	49510	1.71
T_8	Propiconazole 25EC @ 0.1%	441	88200	30600	57600	1.88
T_9	Difenoconazole 25EC @0.025%	519	103800	31800	72480	2.26
T_{10}	Mancozeb 75WP @ 0.25%	532	106400	28400	78000	2.75
T_{11}	Untreated Control	206	41200	27000	14200	0.53

Mehta, K. H. and Solanki, V. A. 1990. A status report on plant pathological work carried out at Main Spices research Station, Jagudan and Gujarat Agricultural University, Gujarat (India).

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.

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., Choudappa, P. C. and Anwer, M. M. 2013. Efficacy of fungicides for the management of *Alternaria* blight of cumin. *International J. Seed Spices* 3(1):48-49.

Solanki, J. S., Singh, R. R. and Delela, G. G. 1973. Field evaluation of fungicides in controlling *Alternaria* blight of *Cuminum cyminum* L. *Ind. J. Mycol. and Plant Pathol*. 3:191- 197.

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

Received : April 2017; Revised : June 2017; Accepted : June 2017.