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Kokare GA

Department of Plant Pathology,
College of Agriculture, Dr.
Balasaheb Sawant Konkan
Krishi vidyapeeth, Dapoli,
Maharashtra, India

Joshi MS

Department of Plant Pathology,
College of Agriculture, Dr.
Balasaheb Sawant Konkan
Krishi vidyapeeth, Dapoli,
Maharashtra, India

Gadhavne AD

Department of Plant Pathology,
College of Agriculture, Dr.
Balasaheb Sawant Konkan
Krishi vidyapeeth, Dapoli,
Maharashtra, India

Dawle MB

Department of Plant Pathology,
College of Agriculture, Dr.
Balasaheb Sawant Konkan
Krishi vidyapeeth, Dapoli,
Maharashtra, India

Khadtare RM

Department of Plant Pathology,
College of Agriculture, Dr.
Balasaheb Sawant Konkan
Krishi vidyapeeth, Dapoli,
Maharashtra, India

Corresponding Author:**Kokare GA**

Department of Plant Pathology,
College of Agriculture, Dr.
Balasaheb Sawant Konkan
Krishi vidyapeeth, Dapoli,
Maharashtra, India

Management leaf spot of field bean (*Lablab purpureus* L.) caused by *Alternaria alternata* (Fr.) Keissler

Kokare GA, Joshi MS, Gadhavne AD, Dawle MB and Khadtare RM

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Abstract

In present studies, 18 genotypes of field bean were screened under natural epiphytotic conditions in field against *Alternaria* leaf spot at Dapoli (M.S) location revealed that, disease intensity was less in DPLW-2010-7-4-1-31 (25.24 %). Maximum disease intensity was observed in DPLW-2010-6-1-1-8 (32.76 %). Remaining germplasm entries recorded the intensity in range of 26.93 % to 31.72 %. All the germplasm lines screened against *Alternaria* leaf spot were moderately susceptible. Among the fungicides evaluated *in vitro*, propiconazole 25 % EC @ (0.05 %) recorded complete inhibition of growth of the test fungus. Thiophanate methyl 70 % WP (0.1 %) was found to be less effective and it recorded mean colony diameter of 47.2 mm and also lowest per cent reduction over control (47.55 %). Field evaluation of different fungicides revealed that, propiconazole 25 % EC (0.05 %) was found most effective with least terminal disease intensity (12.57 %) and maximum yield of 11.11 q ha⁻¹. It was followed by difenconazole 25 % EC @ 0.05 % (13.94 %).

Keywords: Management, *Lablab purpureus* L. and *Alternaria alternata*

Introduction

Field bean (*Lablab purpureus* L.) is an important leguminous grain and vegetable of Indian origin, popularly known as lablab bean belongs to the family leguminosae. In *Konkan* region, it is grown on residual moisture after *kharif* rice (Kshirsagar *et al.*, 2017). The total production of field bean in Maharashtra is 71.55 (000 Tonnes) this crop is multipurpose, mainly grown for its green pods mainly for grain purpose. Being a legume, it has ability to fix nitrogen into soil thereby improving soil fertility and crop yields in an economic and environment friendly manner. It is popularly known as Wal in Maharashtra. The *Konkan* region accounting 80 % of total area under lablab bean in Maharashtra and is about 60,000 ha (Davari *et al.*, 2018) [1]. Though, the area occupied in the in *Konkan* region is more, the average yield per hectare is comparatively low. The main reason for low yield is the practice of cultivation on residual moisture. In addition, the foliar and soil borne diseases of field bean also contribute substantially in drastic reduction in yield. The foliar diseases are known to cause up to 20 % reduction in yield (Pande, 2006) [22]. *Alternaria* leaf spot caused by *Alternaria alternata* (Fr.) Keissler, is one of the most important and destructive diseases causing accountable qualitative and quantitative losses. Varietal improvement and use of effective fungicides are to major options to reduce disease severity. With this view, the advanced breeding lines were screened to identify resistant source and evaluation of fungicides was carried out.

Material and methods

Screening advance breeding lines of field bean against *A. alternata*. The experiment consists of 17 advanced breeding lines and *Konkan* wal-2 was used as check. The reaction of germplasm against *Alternaria alternata* was tested under natural epiphytotic conditions at College of agriculture Dapoli. Five plants of each genotype were tagged for recording the observations using 0-9 disease rating scale (Mayee and Datar, 1986) [18]. All the genotypes were regularly observed for the intensity of the disease and observations were recorded at weekly interval. Varietal reaction to *Alternaria* leaf spot was determined on the basis of the terminal disease severity. *In vitro* evaluation of fungicides

The experiment were planned to evaluate *in vitro* efficacy of seven fungicides against *Alternaria alternata*, causing leaf spot of field bean by applying Poisoned Food Technique (Nene and Thapliyal, 1993) [21]. The efficacy of fungicides was expressed as percent inhibition of mycelia growth over control and was calculated by using the formula given by Vincent (1927) [33]. The data obtained were averaged and analysed statistically.

$$\text{Per cent Inhibition (I)} = \frac{C - T}{T} \times 100$$

Where,

C = Growth (cm) of test fungus in untreated control plate.

T = Growth (cm) of test fungus in treated plate.

Field evaluation of fungicides

Field experiment was conducted to evaluate fungicides in RBD with three replications and eight fungicidal treatments. Healthy seeds of field bean (Konkan wal- 2) were sown in the experimental plots (3X3 m), at spacing of 30X30 cm. The crop was grown by applying all recommended package of practices and irrigated the crop, whenever required. A total of three foliar sprays of the test fungicides as given table 3 were undertaken at an interval of 15 days, starting first spray at initiation of *Alternaria* leaf spot symptoms (48 DAS).

Observations on leaf spot intensity were recorded in 0-9 scale (Mayee and Datar, 1986) [18]. Treatment wise Pods were harvested in 5 succeeding pickings at maturity stage,

Treatment wise cumulative pod yield data was obtained and calculated on hectare basis.

The data obtained in all the experiments (*in vitro* and *in vivo*) was statistical analyzed (Panse and Sukhatme, 1978) [23]. The standard error (S.E.±) computed and critical difference (C.D.) was computed at P = 0.01 and P=0.05, for *in vitro* and *in vivo* experiments respectively and interpreted the results.

Results and Discussion

Screening of advance breeding lines of field bean against *A. alternate* the data presented (Table 1) revealed that, per cent disease intensity (PDI) was least in DPLW-2010-7-4-1-31 (25.24%). It was followed by DPLW-2010-17-4-1-10(26.72%).

Maximum intensity was observed in DPLW-2010-6-1-1-8 (32.76%). Remaining breeding lines entries recorded the leaf spot intensity in a range of 26.93% to 31.72 %. All the breeding lines screened against *Alternaria* leaf spot were found to be moderately susceptible. Similar types of work have been recorded by Rawool, (1997) [25] who screened twenty varieties and F2 population of different crosses of field bean and reported that the performance of Konkan wal-2 (29.47%), Konkan Bhushan (28.71%), ACCW-113 (23.39%) and Hebbal -3 (22.88%) was not satisfactory. The F2 population of ACCW-166 X Arka Vijay showed minimum disease incidence (9.9 %) and it was found to be resistant to *Alternaria* leaf spot of dolichos bean under field condition in Dapoli.

Table 1: Terminal disease severity of *Alternaria* leaf spot (90 DAS) on field bean advance breeding lines.

Tr. no	Treatments	Plant Disease Severity (%)			Mean %	Reaction
		R1	R2	R3		
1	DPLW-2010-4-1-1-15	29.42 (32.85)	28.12 (32.02)	29.74 (33.05)	29.09	MS
2	DPLW-2010-4-4-1-17	27.50 (31.63)	28.30 (32.14)	29.13 (32.66)	28.31	MS
3	DPLW-2010-5-4-2-20	30.12 (33.29)	29.15 (32.68)	28.00 (31.95)	29.09	MS
4	DPLW-2010-6-1-1-8	31.49 (34.14)	32.78 (34.93)	34.00 (35.67)	32.76	MS
5	DPLW-2010-6-2-2-7	26.40 (30.92)	26.50 (30.98)	27.89 (31.88)	26.93	MS
6	DPLW-2010-6-5-3-20	27.49 (31.62)	28.61 (32.34)	29.30 (32.77)	28.47	MS
7	DPLW-2010-7-4-1-31	25.47 (30.31)	26.12 (30.74)	24.13 (29.42)	25.24*	MS
8	DPLW-2010-8-2-2-26	28.32 (32.15)	29.45 (32.87)	30.12 (33.29)	29.30	MS
9	DPLW-2010-9-4-1-20	31.43 (34.10)	31.62 (34.22)	32.12 (34.52)	31.72	MS
10	DPLW-2010-12-1-2-10	26.5 (30.98)	27.62 (31.71)	28.64 (32.36)	27.59	MS
11	DPLW-2010-13-5-3-1	29.30 (32.77)	28.49 (32.26)	27.61 (31.70)	28.47	MS
12	DPLW-2010-17-4-1-10	28.4 (32.20)	26.31 (30.86)	25.45 (30.30)	26.72	MS
13	DPLW-2010-18-1-1-5	29.25 (32.74)	30.42 (33.47)	29.51 (32.90)	29.73	MS
14	DPLW-2010-18-3-1-2	28.67 (32.37)	29.18 (32.70)	30.41(33.47)	29.42	MS
15	DPLW-2010-18-3-2-9	31.13 (33.91)	30.15 (33.30)	29.18 (32.70)	30.15	MS
16	DPLW-2010-18-5-1-8	28.55 (32.30)	28.13 (32.03)	26.34 (30.88)	27.67	MS
17	DPLW-2010-19-3-1-3	29.65 (32.99)	29.28 (32.76)	28.12 (32.02)	29.02	MS
18	KONKAN WAL 2	29.57 (32.94)	30.14 (33.30)	31.64 (34.23)	30.45	MS
SEm±				0.44		
C.D.(P=0.05)				1.10		

Figures in parentheses are arcsine transformed value* Least plant disease intensity.

The perusal of (Table 1) revealed that none of the breeding lines tested do not possess good source of genetic resistance to *Alternaria* leaf blight. Therefore, it is necessary to test different fungicides to manage this disease.

In vitro evaluation of fungicides against *A. alternate* Perusal of (Table 2) revealed that the effect of fungicides on growth of *A. alternate* was significant. Among different fungicides, propiconazole 25% EC (0.05 %) and difenconazole 25 % EC @ (0.05 %) showed complete inhibition of mycelial growth of *A. alternata*. This was followed by copper oxychloride 50 %

WP (0.2 %), mancozeb 63 % WP + carbendazim 12 % WP (0.2 %), mancozeb 75 % WP (0.2 %), chlorothalonil 75 % WP (0.2%). Among these fungicides thiophanate methyl 70 % WP (0.1 %) was found to be less effective and it recorded mean colony diameter of 47.2 mm. lowest per cent reduction over control (47.55 %) was recorded in this treatment. Thaware *et al.* (2010) evaluated different fungicides against *A. alternata* causing leaf blight of cowpea. They reported that, propiconazole 25 % EC (0.05 %) completely inhibited mycelial growth of *A. alternate*.

Table 2: *In vitro* evaluation of different fungicides against mycelial growth of *A. alternata*,

Tr. No.	Treatments	Conc. %	Mean Colony Diameter (cm)*	Per cent inhibition over control
T1	Mancozeb 75 % WP	0.2 %	2.10	76.66
T2	Propiconazole 25 % EC	0.05 %	0	100
T3	Difenconazole 25 % EC	0.05 %	0	100
T4	Mancozeb 63 % + Carbendazim 12 % WP	0.2 %	2.02	77.55
T5	Thiophanate methyl 70 % WP	0.1 %	4.72	47.55
T6	Copper oxychloride 25 % EC	0.2 %	0.60	93.33
T7	Chlorothalonil 75 % WP	0.2 %	3.60	60.00
T8	Control	—	9.00	—
SE.m ±			0.09	
C.D. (P = 0.01)			0.37	

* Means of three replications.

Field evaluation of fungicides

Result (Table 3) revealed that all the fungicidal treatments significantly reduced leaf spot disease intensity of field bean. The disease appeared at 48 days after sowing, which later increased steadily up to second spraying and decreased thereafter the disease intensity in fungicidal treatments ranged from 4.79 to 7.43 per cent at 45-60 DAS. After 1st and 2nd sprays, disease intensity ranged from 11.32 to 24.26 % and 20.14 to 29.69 %, respectively, as against 27.32 - 31.45 %, respectively in untreated control.

The treatment of propiconazole 25 % EC (0.05 %) was found most effective with least terminal disease intensity (12.57 %) and highest reduction (69.54 %) of *Alternaria* leaf spot. It was

followed by difenconazole 25 % EC (0.05%), copper oxychloride 25 % EC (0.2 %), mancozeb 63 % WP + carbendazim 12 % WP (0.2 %), mancozeb 75 % WP (0.2 %) and chlorothalonil 75 % WP (0.2 %). Thiophanate methyl 70 % WP (0.1 %) was found to be comparatively less effective in reducing the *Alternaria* leaf spot of field bean. These results are in agreement with the reports of earlier workers. Rajpurohit and Nema (2013) evaluated the fungicides against *Alternaria* leaf spot of sesame and reported that foliar sprays of fungicides viz. carbendazim + iprodione @ 0.1%, carbendazim + mancozeb @ 0.2% and propiconazole @ 0.1% as highly effective and economical for management of the disease.

Table 3: Efficacy of various treatments against leaf spot intensity in dolichos bean.

Tr. No.	Treatments (Conc.)	Terminal Disease Intensity (%)*	Red. Over control (%)	Av. yield* q ha-1	% Yield Increase over control
T1	Mancozeb 75 % WP (0.2%)	18.28 (25.31)	55.70	9.59	40.25
T2	Propiconazole 25 % EC (0.05%)	12.57 (20.76)	69.54	11.11	48.42
T3	Difenconazole 25 % EC (0.05%)	13.94 (21.93)	66.22	10.55	45.68
T4	Mancozeb 63 % WP + Carbendazim 12 % WP (0.2%)	17.53 (24.75)	57.52	9.88	42.00
T5	Thiophanate methyl 70 % WP (0.1%)	23.35 (28.89)	43.42	8.03	28.64
T6	Copper Oxychloride 25 % EC (0.2%)	15.33 (23.05)	62.85	10.00	42.07
T7	Chlorothalonil 75 % WP (0.2%)	20.66 (27.03)	49.93	8.85	35.25
T8	Control	41.27 (39.97)	-	5.73	-
S. E. m ±%		0.28	-	0.23	-
C.D. (P=0.05)		0.85	-	0.53	-

*Means of three replications, Conc.: Concentration, Appear.: Appearance, Av.: Average, DI:

Disease incidence, Red.: Reduction, Figures in parenthesis are arcsine transformed values.

Results (Table 3) revealed that the treatments attempted to manage leaf spot disease, significantly influenced the yield of field bean. Maximum yield (11.11 q ha-1) was recorded in the treatment of propiconazole 25 % EC (0.05 %). It was followed by difenconazole 25 % EC @ 0.05 % (10.55 q ha-1). The per cent increase in yield (q / ha), over untreated control ranged from 28.64 to 48.42 per cent. However, it was significantly highest in the treatment of propiconazole 25 % EC @ 0.05 % (48.42 %) followed by difenconazole 25 % EC @ 0.05 % (45.68 %).

It is therefore concluded that for effective management of leaf spot of field bean, three sprays of propiconazole 25 % EC (0.05 %) are effective. The first spray be given at the initiation of symptoms followed by two more sprays at fortnightly interval.

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