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Research Article

MANAGEMENT OF *FUSARIUM* WILT IN DATE PALM

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Abstract: The Research was conducted on bio-efficacy of fungicides against *Fusarium* sp. of date palm at Department of Plant Pathology, S. D. Agricultural University Sardarkrushinagar, Gujarat. Four systemic, four non-systemic and four combined fungicides at different concentrations were tested against *Fusarium* sp. through poisoned food technique. Among the systemic fungicides, propiconazole and carbendazim recorded 99.89 per cent and 98.80 per cent mycelial growth inhibition at 500 ppm respectively. Among the non-systemic fungicides 99.98 per cent mycelial growth inhibition over control was recorded in copper oxychloride at 2000 ppm. Among combined fungicides carbendazim + mancozeb recorded significantly highest 99.47 per cent growth inhibition over control at 1000 ppm concentration.

Keywords: *Fusarium sp., Date palm, Systemic fungicides, Non-systemic fungicides, Combined fungicides*

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Introduction

Date palm is one of the oldest domesticated fruit crops, belongs to the family Palmaceae. Date palm affected with group of fungi causes reduces the growth and production. Date palm roots are liable to attack by several pathogenic soil borne fungi, that causing serious diseases *viz., Fusarium oxysporum, F. solani, F. moniliforme, F. semitectium, F. equiseti.*

The most common disease of date palm was caused by *Fusarium oxysporum* f.sp. albedinis. Symptoms appeared on the leaves, fruit stalks and the heart of palm tree. The symptoms on fruit stalks appeared as brown necrosis and stunting of new fruit stalks. On the heart of palm tree, the new leaves exhibited yellow to brown color. Hence, evaluation of fungicides to manage *Fusarium* sp. were very much informative in date palm. Therefore, *in vitro* bio-efficacy of fungicides against *Fusarium* sp. is necessary for the disease management.

Material and Methods

To manage the *Fusarium* wilt disease of date palm caused by *Fusarium oxysporum* f.sp. albedinis, an experiment was conducted *in vitro* at Department of Plant pathology C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. Poisoned food technique was used to evaluate the *in vitro* efficacy of fungicides against *Fusarium* sp. Potato dextrose agar medium were prepared and distributed at the rate of 100 ml in 250 ml conical flask, autoclaved at 1.05 kg/cm^2 for 15 min then before solidification of media different fungicides of desired concentration were incorporated aseptically in different flasks. These flasks were shaken thoroughly and poured in petriplates 20 ml/plate likewise three plates for each treatment were maintained. One set of three plates were poured without any fungicides to serve as a control. After solidification of medium, the plates inoculated with seven days old pathogen separately. The 5 mm diameter mycelial disc selected from peripheral growth of the plate by sterilized cork borer were used for inoculating the plates by keeping one disc per plate in the centre in inverted position, to make the mycelial growth touch the surface medium. The inoculated plates were incubated at room temperature for seven days.

Observations recorded

The colony diameter of the fungal pathogen on medium were recorded and per cent mycelial growth inhibition in each treatment were calculated by using following formula [1].

PGI = (C-T)/C×100
Where,
PGI = Percent grown inhibition
C = Colony diameter in control (mm)
T = Colony diameter in treatment (mm)

Results and Discussion

In the present investigation, four systemic, four non-systemic and four combined fungicides at different concentrations were tested *in vitro* for their comparative efficacy against the growth of *Fusarium* sp., through poisoned food technique.

Wilt disease of date palm have resulted due to infection caused by *Fusarium* sp. hence systemic fungicides from different groups like (Tebuconazole, propiconazole, azoxystrobin and carbendazim) were investigated for its *in vitro* efficacy in reducing the radial growth of the fungus [Table-2]. Irrespective of different concentrations, systemic fungicide exerted significant effect on the growth inhibition of the fungus.

Average growth inhibition expressed by various systemic fungicides ranged from 49.79 to 98.48 per cent. Highest mean inhibition per cent of 98.48 was recorded in Propiconazole 25 EC. It was closely followed by Carbendenzim 50 WP with 94.01 per cent growth inhibition. Azoxystrobin was the next with 59.77 per cent inhibition in the radial growth of *Fusarium* sp. Growth inhibition per cent of 49.79 per cent in Tebuconazole expressed less inhibition potential in comparison to other group fungicides and azoxystrobin.

The present investigation was like the research work carried out by Maitlo *et al*. (2015) [2] fungicides at three different concentrations inhibited the mycelial growth of *Fusarium solani* on date palm.

Table-1 List of fungicide tested against pathogen in vitro

SN	Common name	Concentration (ppm)		
I.	Systemic fungicides			
1.	Tebuconazole 25 EC	100	250	500
2.	Propiconazole 25 EC	100	250	500
3.	Azoxystrobin 23 SC	100	250	500
4.	Carbendazim 50 WP	100	250	500
II.	Non systemic fungicide			
5.	Mancozeb 75 WP	1000	1500	2000
6.	Chlorothalonil 75 WP	1000	1500	2000
7.	Propineb 70WP	1000	1500	2000
8.	Copper oxychloride 50 WP	1000	1500	2000
III.	Combined fungicides			
9.	Carbendazim 12 % + Mancozeb 63 % WP	250	500	1000
10.	Metalaxyl 8 % + Mancozeb 64 % WP	250	500	1000
11.	Carbendezim 25 % + iprodione 25 % WP	250	500	1000
12.	Captan 50% WP + Hexaconazole 5% WP	250	500	1000

Table-2 Bio-efficacy of systemic fungicides against Fusarium sp.

SN	Fungicides	Growth inhibition (%) Concentration (ppm)			Mean
		100	250	500	
1	Tebuconazole 25 EC	42.21^{h}(45.18)	44.38^{gh}(48.94)	47.99^{fg}(55.23)	44.84^{d}(49.79)
2	Propiconazole 25 EC	80.81^{bc}(97.32)	82.50^{b}(98.20)	88.10^{a}(99.89)	83.80^{a}(98.48)
3	Azoxystrobin 23 SC	45.67^{gh}(51.20)	51.70^{ef}(61.63)	54.60^{e}(66.48)	50.66^{c}(59.77)
4	Carbendezim 50 WP	70.18^{d}(88.47)	76.94^{c}(94.80)	83.70^{ab}(98.80)	76.94^{b}(94.01)
5	Control	-	-	-	-
Mean		59.72^{b}(70.53)	63.88^{ab}(75.90)	68.60^{a}(80.10)	
		Fungicides		Concentrations	Fungicides x Concentrations
S.Em. ±		0.55		0.48	0.95
C.D. at 5%		1.6		1.4	2.78
C.V. %		2.58			

Table-3 Bio-efficacy of non-systemic fungicides against Fusarium sp. in vitro

SN	Fungicides	Growth inhibition (%) Concentration (ppm)			Mean
		1000	1500	2000	
1	Mancozeb 75 WP	34.66^{i}(32.37)	37.15^{hi}(36.51)	39.53^{gh}(40.55)	37.11^{c}(36.48)
2	Chlorothalonil 75 WP	41.85^{fg}(44.55)	49.62^{de}(58.06)	52.33^{cd} (62.69)	47.93^{b}(55.10)
3	Propineb 70WP	44.20^{f}(48.64)	48.24^{e}(55.67)	53.25^{c}(64.23)	48.56^{b}(56.18)
4	Copper oxychloride 50 WP	84.60^{b}(99.10)	84.14^{b}(98.93)	89.15^{a}(99.98)	85.97^{a}(99.33)
5	Control	-	-	-	-
Mean		51.33^{c}(56.17)	54.78^{b}(62.29)	58.57^{a}(66.56)	
		Fungicides		Concentrations	Fungicides x Concentrations
S.Em. ±		0.32		0.28	0.55
C.D. at 5%		0.93		0.8	1.61
C.V. %		1.74			

Table-4 Bio-efficacy of combined fungicide against Fusarium sp. in vitro

SN	Fungicides	Growth inhibition (%) Concentration (ppm)			Mean
		250	500	1000	
1	Carbendazim 12 % +Mancozeb 63 % WP	65.28^{c}(82.53)	70.95^{b}(89.30)	87.32^{a}(99.47)	74.52^{a}(90.52)
2	Metalaxyl 8 % + Mancozeb 64 % WP	44.93^{f}(49.92)	51.55^{e}(61.38)	53.95^{e}(65.40)	50.14^{c}(58.90)
3	Carbendezim 25 % + iprodione 25 %	27.95^{h}(21.99)	32.27^{h}(26.97)	35.07^{g}(33.03)	31.43^{d}(27.32)
4	Captan 50% WP + Hexaconazole 5% WP	48.10^{f}(55.45)	60.30^{d}(75.50)	69.96^{b}(88.28)	59.46^{b}(73.07)
5	Control	-	-	-	-
Mean		46.57^{c}(52.47)	53.52^{b}(63.28)	61.58^{a}(71.62)	
		F(Fungicide)		C(Concentration)	F x C
S.Em. ±		0.37		0.31	0.64
C.D. at 5%		1.07		0.93	1.86
C.V. %		2.04			

Figures in the parentheses are original values and outside are arc-sine transformed values
Treatment means with the letter/ letters in common are not significant by Duncan's New Multiple Range Test at 5% level of significance.

Bio-efficacy of non-systemic fungicides against *Fusarium* sp. *in vitro*

The inhibitory effect of different non-systemic fungicides (Mancozeb, Chlorothalonil, Propineb, Copper oxychloride) was tested against the growth of *Fusarium* sp. *in vitro* and the results are presented in [Table-3].

The results presented in [Table-3] revealed that the non-systemic fungicides at different concentrations (1000, 1500 and 2000 ppm) were found inhibitory to the fungal growth. Average growth inhibition expressed by various non systemic fungicides ranged from 36.48 to 99.33 per cent. Highest mean inhibition per cent of 99.33 was recorded in copper oxychloride. It was followed by lower effective Propineb and Chlorothalonil with 56.18 and 55.10 per cent growth inhibition respectively. Mancozeb was the next least effective with 36.48 per cent inhibition in the radial growth of *Fusarium* sp. The results supported the findings by Bhimani *et al.* (2018) [3].

Bio-efficacy of combined fungicide against *Fusarium* sp. *in vitro*

Combined fungicide (Carbendazim + Mancozeb, Metalaxyl+ Mancozeb, Carbendazim + Iprodine and Captan+Hexaconazole) were tested against the radial growth of *Fusarium* sp. by poisoned food technique (Table 4).

It was observed that all the combined fungicides investigated in the experiment exerted a significant effect on the radial growth inhibition of the fungus. Mean growth inhibition per cent was ranged from 27.32 to 90.52. Superior mean inhibition of 90.52 per cent recorded in carbendazim + mancozeb was followed by

73.07 per cent in captan + hexaconazole. Lowest mean inhibition of 58.90 and 27.32 per cent was recorded in matalaxyl + mancozeb and carbendazim + iprodine respectively.
It was observed that all combined fungicides, concentration exerted a significant effect on the growth inhibition of the fungus. Growth inhibition per cent increased with a significant difference by increasing the level of concentration from 100 ppm to 500 ppm. Highest growth inhibition per cent of 71.62 was recorded in 500 ppm. The similar result presented by Bhimani *et al.* (2018) [3].

Conclusion
Systemic fungicide propiconazole and carbendazim demonstrated higher inhibition of the fungus 98.20 and 94.80 per cent inhibition at 250 ppm concentration. From non-systemic fungicide copper oxychloride demonstrated complete inhibition of the fungus at 98.93 to 99.10 per cent inhibition at 1500 ppm and 2000 ppm respectively.

Application of research: In combined fungicide complete inhibition in the radial growth of *Fusarium* sp. was exhibited by carbendazim + mancozeb 90.47 per cent at 1000 ppm.

Research Category: Plant Pathology

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References

[1] Bliss C.A. (1934) *Science*, 79, 39.
[2] Maitlo W.A., Markhand G.S., Abul-Soad A.A., Lodhi A.M. and Jatoi M.A. (2015) *Pakistan Journal of Phytopathology*, 27(01), 07-13.
[3] Bhimani M.D., Golakiya, B.B. and Akbari L.F. (2018) *International Journal of Chemical Studies*, 6(2), 29-34.