



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(12): 1458-1460
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www.thepharmajournal.com
Received: 24-09-2023
Accepted: 28-10-2023

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Bioefficacy of fungicides against damping-off disease in Bidi tobacco nursery condition

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Abstract

Damping-off is the most serious disease of tobacco in nursery conditions caused by *Pythium aphanidermatum*. Looking at the significance of the disease and economic importance of the crop in Gujarat. The experiment was conducted during *Kharif* 2021 at the Bidi Tobacco Research station in Anand, Gujarat. Nine fungicides were evaluated in nursery conditions for their efficacy against *P. aphanidermatum* by spray drench method. Significantly the minimum number of damped-off seedlings was recorded in the treatment of metalaxyl M 4% + mancozeb 64% WP (30/m²) with the highest PDC (92.16%) as compared to all other treatments. The maximum transplantable seedling/m² was observed in the treatment of metalaxyl M 4% + mancozeb 64% WP (910 seedlings/m²) as compared to all other treatments.

Keywords: Damping-off, *P. aphanidermatum*, fungicide, percent disease incidence (PDC)

1. Introduction

Tobacco (*Nicotiana tabacum* L.) is one of the most important non-food crops of the *Solanaceae* family in the world. Tobacco is an important cash crop in terms of revenue generation, export earnings and rural employment. *Bidi* tobacco is attacked by a varied range of pathogens including fungi, bacteria, viruses and nematodes from seedlings to transplanted crops. Damping-off, root-knot and frog-eye leaf spot diseases are major constraints for tobacco cultivation in the nursery stage. Among these, damping-off is the most serious disease in the nursery incited by *Pythium aphanidermatum* (Edson) Fitzpatrick, a soil borne oomycete fungus. Pre-emergence damping-off kills young seedlings before they reach the soil surface. They may be killed even before the hypocotyls have broken through the seed coat (seed rot). When the radical and plumule emerge from the seed, they rot completely. The post-emergence damping-off is quite noticeable. This stage of the disease is distinguished by the toppling of infected seedlings at any point after they emerge from the soil until the stem has hardened sufficiently to resist invasion. Infection typically occurs at or below ground level and infected tissues appear water-soaked and soft. As the disease progresses, the stems at the base become constricted and the plants collapse. Seedlings that appear to be healthy one day may have collapsed on the next day (Singh, 1990)^[8].

The present study aimed to evaluate the efficacy of different fungicides against damping-off disease of *bidi* tobacco plants.

2. Materials and Methods

The experiment was conducted at Bidi Tobacco Research station in Anand, Gujarat during *Kharif* 2021 in the nursery to find out the effect of different treatments for the management of damping-off in *bidi* tobacco. For this investigation Randomized Block Design was used with three replications and ten treatments were taken. The mycelial mat for inoculation purposes was obtained by growing the pathogen *P. aphanidermatum* on oat meal agar. Actively growing 4 days old culture was collected by scrapping the fungal mycelial mat with the help of sterilized forceps. The fungal mycelial mat was blended in the blender with the required quantity of sterilized water and such freshly macerated mycelial suspension was used for soil inoculation. Each bed was inoculated with fully grown four Petri plates (90 mm diameter). Such fungal suspension was incorporated into the soil before one week of seeding, while fungicides were spray-drenched at the time of initiation of disease, second and third at 10-day interval. The beds without fungicides were served as control. Nursery beds were seeded with tobacco cultivar GT 7. Proper agronomical practices were followed. Observations on a number of damped-off seedlings were recorded and statistically analyzed.

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Percent disease incidence and percent disease control were calculated as per the below formula.

$$\text{Percent Disease Incidence (PDI)} = \frac{\text{Number of damped off seedling}}{\text{Total number of seedlings}} \times 100$$

3. Results and Discussion

The result presented in Table 1 revealed that the germination count was uniform as statistical difference was non-significant. Significantly the minimum number of damped-off seedlings was recorded in the treatment of metalaxyl M 4% + mancozeb 64% WP (36/m²) with the highest PDC (92.16%) and it was at par with azoxystrobin 18.2% + difenoconazole 11.4% SC (36/m²) with PDC (88.16%) and benalaxyl-M 4% + mancozeb 65% WP (40/m²) with PDC (86.61%), metalaxyl 8% + mancozeb 64% WP (42/m²) with PDC (85.19%). The next best treatment in order of merit were bordeaux mixture (50/m²) with PDC (79.29%), kresoxim-methyl 18% + chlorothalonil 56% WG (61/m²) with PDC (68.54%), metiram 55% + pyraclostrobin 5% WG (72/m²) with PDC (60.19%), fenamidone 10% + mancozeb 50% WDG (81/m²) with PDC (55.89%) and cymoxanil 8% + mancozeb 64% WP (113/m²) with PDC (44.05%).

The maximum transplantable seedling/m² was observed in the treatment of metalaxyl M 4% + mancozeb 64% WP (910 seedlings/m²) which was followed by azoxystrobin 18.2% + difenoconazole 11.4% SC (710 seedlings/m²) and benalaxyl-M 4% + mancozeb 65% WP (693 seedlings/m²), metalaxyl 8% + mancozeb 64% WP (654 seedlings/m²) which was at par with each other. The next best treatment in order of merit were bordeaux mixture (543 seedlings/m²), kresoxim-methyl 18% + chlorothalonil 56% WG (415 seedlings/m²), metiram 55% + pyraclostrobin 5% WG (372 seedlings/m²), fenamidone 10% + mancozeb 50% WDG (370 seedlings/m²) and cymoxanil 8% + mancozeb 64% WP (336 seedlings/m²). In the present study, the minimum number of damped-off seedlings per plot and maximum percent disease control was obtained in metalaxyl M 4% + mancozeb 64% WP, azoxystrobin 18.2% + difenoconazole 11.4% SC and benalaxyl-M 4% + mancozeb 65% WP treatment which conformed with results obtained by Shenoi and Wajid (1992) [7], Bhatt (1985) [1], Patel *et al.* (1988) [5] and Jahagirdar (2012) [3]. Similar results are reported by Rahman and Bhattiprolu (2005) [6], Male and Vawdrey (2010) [4], Zagade *et al.* (2012) [10], Tekale *et al.* (2019) [9] and Ekabote *et al.* (2019) [2] in different solanaceous crops against *P. aphanidermatum*.

Table 1: Bioefficacy of fungicides against *P. aphanidermatum* under nursery condition

Sr. No.	Treatments	Concentration (%)	Germination count/25 cm ²	No. of damped-off seedlings	PDI (%)	PDC (%)	No. of transplantable seedlings	Fresh plant weight (g)
1.	Kresoxim-methyl 18% + Chlorothalonil 56% WG	0.144	4.30	61 ^{cd}	12.81	68.54	415 ^d	402
2.	Metiram 55% + pyraclostrobin 5% WG	0.210	5.50	72 ^{de}	16.21	60.19	372 ^d	442
3.	Benalaxyl-M 4% + mancozeb 65% WP	0.365	4.30	40 ^{ab}	5.45	86.61	693 ^b	402
4.	Azoxystrobin 18.2% + difenoconazole 11.4% SC	0.030	5.50	36 ^{ab}	4.82	88.16	710 ^b	365
5.	Cymoxanil 8% + mancozeb 64% WP	0.216	4.00	113 ^f	22.78	44.05	336 ^d	359
6.	Fenamidone 10% + mancozeb 50% WDG	0.180	4.60	81 ^e	17.96	55.89	370 ^d	428
7.	Metalaxyl 8% + mancozeb 64% WP	0.072	4.70	42 ^{ab}	6.03	85.19	654 ^b	387
8.	Metalaxyl M 4% + mancozeb 64% WP	0.034	5.60	30 ^a	3.19	92.16	910 ^a	362
9.	Bordeaux mixture	0.600	5.40	50 ^{bc}	8.43	79.29	543 ^c	359
10.	Control	-	4.50	224 ^g	40.72	-	326 ^d	325
	S. Em. ±	-	1.68	4.43	-	-	31.63	24.97
	C.D. at 5%	-	NS	Sig.	-	-	Sig.	NS
	C.V. %	-	10.43	10.24	-	-	10.28	11.34

Note: Treatment means with the letter/letters in common are not significant by Duncan's new multiple range test (DNMRT) at a 5 percent level of significance PDI: Percent disease incidence, PDC: Percent disease over control or Disease reduction over control



General experiment view: Management of damping-off of *bidi* tobacco under nursery condition

T₈: Metalaxyl M 4% + mancozeb 64% WPT₁₀: Control

4. Conclusions

Among all the nine fungicides the treatment of metalaxyl M 4% + mancozeb 64% was superior rest of the fungicides. Also, it can be concluded that spray drenching with metalaxyl M 4% + mancozeb 64% reduced the damped-off seedling significantly over control and the rest of the fungicides tested. Azoxystrobin 18.2% + difenoconazole 11.4% SC and benalaxyl-M 4% + mancozeb 65% WP, metalaxyl 8% + mancozeb 64% WP were at par in reducing the number of damped-off seedlings.

5. Acknowledgement

The researchers highly acknowledge the Hon. Vice Chancellor, Dr. K. B. Kathiria; Director of Research and Dean PG studies, Dr. M. K. Jhala, Principal and Dean, Dr. Y. M. Shukla and Prof and Head Department of Plant Pathology Dr. R. G. Parmar for the keen guidance and support throughout the course of study.

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