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IMPACT OF FUNGICIDES ON POWDERY MILDEW, *ALTERNARIA* AND *CERCOSPORA* LEAF SPOT DISEASES OF NIGER (*GUIZOTIA ABYSSINICA* CASS) CV UNDER SOUTH GUJARAT REGION

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ABSTRACT
Niger (*Guizotia abyssinica* Cass) is one of the important minor oilseed crop of hilly regions globally it is used for oil purpose. Not much information is available on diseases of Niger crop plant. Therefore a study was planned to document the diseases with four replications at the Niger Research Station (NRS) at Navsari Agricultural University (NAU), Vanarasi, Navsari and Gujarat on the foliar diseases of Niger cultivar. In this experiment, six different fungicides have been evaluated to control the Powdery mildew, *Cercospora* and *Alternaria* leaf spot diseases out of which, all the fungicidal treatments were significantly superior over the control. The least intensity of *Cercospora and Alternaria* leaf spot 12.42 PDI and 14.39 PDI was observed respectively in T6 (Carbendazim + Mancozeb 0.2%), which was followed by treatment T1 (Carbendazim 0.1%) for *Cercospora* (14.42 PDI) and *Alternaria* leaf spot (17.01 PDI). Whereas, the least intensity of Powdery mildew disease 6.05 PDI was observed in T5 (Wettable sulphur 0.2%), which was followed by T1 (Carbendazim 0.1%) 7.52 PDI. In respect to seed yield analysis, treatment T6 (Carbendazim + Mancozeb 0.2%) gave significantly higher yield followed by treatment T1 (Carbendazim 0.1%). Therefore it may be concluded that Carbendazim + Mancozeb 0.2% fungicide is superior for the control of the leaf spot diseases and gave higher seed yield in Niger crop.

INTRODUCTION

Niger (*Guizotia abyssinica* Cass) is one of the important minor oilseed crops of India. In India, it is mainly cultivated in tribal pockets of Gujarat, M.P., Orissa, Maharashtra, Bihar, Karnataka and Andhara Pradesh. Niger is a crop of dry areas grown mostly by tribal and interior places as life line of tribal segment. It is also know by various names such as Ramtilor Kalatil in India and Noog in Ethiopia. The Niger crop is found infested by number of diseases and pests, which causes harsh damage to the crop. Further, the accidental rain at flowering stage leads the expansion of *Alternaria* and *Cercospora* leaf spot incidence and results in the poor seed set and seed yield. The crop is affected by number of fungal diseases. The important diseases of Niger are Alternaria blight (*Alternaria porii* and *A. alternata*), Leaf spot (*Cercospora guizoticola*), Seedling blight (*Alternaria tenuis*), Seed rot (*Rhizotonia bataticola*), Rust (*Puccinia guizotiae*), Powdery mildew (*Sphaerotheca* sp.), Root rot (*Macrophomina phaseolina*) and Cuscuta as *Phanerogamic* parasite (Rajpurohit, 2004 and Rajpurohit and Dubal, 2009). *Cercospora* and *Alternaria* leaf spot diseases cause heavy damage to this crop and reduce its seed yields, which harm the status of the farmers. Due to Powdery mildew disease in Niger crop, the yield loses are due to early defoliation and all the aerial parts develop symptoms. Small cottony spot develops on the leaves which gradually cover the whole lamine (Vyas *et al.*, 1981). Some times on stem purple rings also develops. The diseased leaves turn yellow and drop off. The seed formed on diseased plants are small and shriveled. The pathogen is known to survive through some unknown collateral hosts. Niger crop is economically important because it is used for oil purpose mainly by the tribal people and it is suitable for integrated farming system with leguminous as well as with oil seed crops. Currently studies pertaining to the use of fungicides in management of diseases are highly emphasized (Kolte, 1985, Sharma, 1989, Rajpurohit *et al.*, 2005, Rajpurohit, 2011).

Looking on importance in terms of oil extraction, which having high medicinal values but knowledge of the diseases of this Niger crop merits attention, Niger is a crop of dry areas grown mostly by tribal in interior places due to which desired attention has not been given on the biotic and abiotic stresses. Now the crop is gaining importance and studies are being made on disease aspects (Rajpurohit, 2011). Among the fungicides quintal @ 2g per litre had given significantly higher number of effective capitula per plant (47.02), number of filled seeds per capitula (15.37), seed yield per plant (3.59 g), 1000 seed weight (4.15 g), yield per ha (368 kg/ha) over control and was on par with other fungicides when Niger was protected from leaf spot disease with the fungicidal spray, which recorded significantly higher values over unsprayed control (Kivadasannavar *etal.*, 2007). Whereas, these yield components were decreased in unsprayed controlled condition (Gorbert *et al.,* 1982 and Indi *et al.,* 1986). Therefore, this study was planned to record the diseases of Niger crop plant so that preventive measures can be taken well in advance

to avoid any crop damage. Keeping in view the destructive nature of the diseases and economic loss, the present investigation was undertaken to evaluate the efficacy of different fungicides under *in vivo* condition.

MATERIALS AND METHODS

To manuscript the diseases of Niger crop plant, similar method was followed as adopted by Wheeler, 1969. For this, the experiment was laid out in RBD with the four replications at Niger Research Station (Vanarasi farm), Navsari Agricultural University (NAU), Navsari (Gujarat). In this experiment below, six different treatments was incorporated along with the control.

T_1- Carbendazim 50 WP (0.1%)

T_2- Hexaconazole (0.1%)

T_3- Mancozeb (0.2%)

T_4- Propiconazole (0.1%)

T_5- Wettable Sulphur (0.2%)

T_6- Carbendazim + Mancozeb (0.2%)

T_7- Control

Design : RBD Replications : Four

Plot size : 4 X 3 m Spacing : 30 X 10 cm

Application of required dose of fungicides was sprayed at the initial appearance of the disease and second at the interval of 15 days. Observation on foliar disease infection was calculated on Niger plant by observing top, middle and bottom leaves of the plant were chosen and scored as per the scale given below.

Table 1: Disease rating scale

Score	Description	Reaction
0	No infection	Immune
1	1-10 % lead area infected	Resistant
2	11-25 % lead area infected	Moderately Resistant
3	26-50 % lead area infected	Moderately Susceptible
4	51-70 % lead area infected	Susceptible
5	71-100 % lead area infected	Highly Susceptible

Percent Disease Incidence (PDI) was recorded as per the disease intensity at field condition prior to spray and at the time of harvest by using Disease Rating scale of (0 to 5) as developed by Mayee and Datar, 1986, Townsend and Heuberger, 1943 (Table 1).

The average intensity in each plot was calculated by the formula as employed by Wheeler, 1969.

$$PDI = \frac{\text{Summation of infected plants}}{\text{No. of leaves observed x Max. Disease score}} \times 100$$

RESULTS AND DISCUSSION

In this experiment, different fungicides have been evaluated to control the *Alternaria* disease as the disease appears as concentric rings on the leaves, which turns brown with gray centre later on. The spots become oval or circular and become irregular in shape. The infected leaves become dry and lead to the defoliation (Yirgu, 1964). In case powdery mildew disease, small cottony spot develops on the leaves which gradually cover the whole lamine (Vyas *et al.*, 1981). Here, all the fungicidal treatment was significantly superior over control. As far as *Cercospora* leaf spot disease is concerned, it is more severe under warm and humid weather. Small straw colored to brownish spots are formed on both the leaf surfaces. Later the spots are increase in number and size and cover the entire lamina and leaves start dropping off (Rajpurohit, 2011, Sandipan *et al.*, 2014). Different fungicides were evaluated to control the disease out of which, all the fungicidal treatment were significantly superior over control. The least intensity of *Cercospora* leaf spot 12.42 PDI was observed respectively in T6 (Carbendazim + Mancozeb 0.2%), which was followed by the treatment T1 (Carbendazim 0.1%) for *Cercospora* (14.42 PDI) respectively. Rests of the fungicides were found more or less superior over control (Table 2).

The least intensity of *Alternaria* leaf spot 14.39 PDI was observed respectively in T6 (Carbendazim + Mancozeb 0.2%), which was followed by the treatment T1 (Carbendazim

Table 2: Efficacy of foliar sprays on incidence of *Cercospora* leaf spot (*Cercospora guizoticola*) disease of Niger

Sr.No.	Treatment	Replication I	II	III	IV	Mean
T-1	Carbendazim 50%wp (0.1%)	14.83 (22.6)	14.14 (22.1)	14.20 (22.1)	14.52 (22.4)	14.42 (22.3)
T-2	Hexaconazole (0.1%)	20.10 (26.6)	18.52 (25.5)	19.96 (26.5)	20.52 (26.9)	19.78 (26.4)
T-3	Mancozeb (0.2%)	22.52 (28.3)	24.32 (29.5)	22.30 (28.2)	23.86 (29.2)	23.25 (28.8)
T-4	Propiconazole (0.1%)	21.94 (27.9)	19.62 (26.3)	20.36 (26.8)	20.60 (27.0)	20.63 (27.0)
T-5	Wettable Sulphur (0.2%)	28.40 (32.2)	30.80 (33.7)	28.44 (32.2)	27.12 (31.4)	28.69 (32.4)
T-6	Saaf , Carbendazim + Mancozeb (0.2%)	12.20 (20.4)	13.83 (21.8)	11.52 (19.8)	12.14 (20.4)	12.42 (20.6)
T-7	Control	41.22 (39.9)	43.48 (41.3)	42.32 (40.6)	43.48 (41.3)	42.63 (40.8)
SEm+_						0.36
CD at 5%						1.06
CV%						2.53

Figures in the parenthesis are arc sin transformed values

Table 3: Efficacy of foliar sprays on incidence of *Alternaria* leaf spot (*Alternaria* sp.) disease of Niger

Sr.No.	Treatment	Replication I	II	III	IV	Mean
T-1	Carbendazim 50%wp (0.1%)	16.96 (24.3)	16.80 (24.2)	17.66 (24.8)	16.60 (24.0)	17.01 (24.35)
T-2	Hexaconazole (0.1%)	18.80 (25.7)	18.42 (25.4)	19.44 (26.2)	19.42 (26.1)	19.02 (25.86)
T-3	Mancozeb (0.2%)	22.42 (28.3)	21.66 (27.7)	22.66 (28.4)	23.84 (29.2)	22.65 (28.41)
T-4	Propiconazole (0.1%)	18.32 (25.3)	20.84 (27.2)	18.62 (25.6)	19.05 (25.9)	19.21 (25.99)
T-5	Wettable Sulphur (0.2%)	27.66 (31.7)	28.96 (32.6)	27.64 (31.7)	28.44 (32.2)	28.18 (32.06)
T-6	Saaf, Carbendazim + Mancozeb (0.2%)	14.40 (22.3)	14.38 (22.3)	14.10 (22.1)	14.66 (22.5)	14.39 (22.29)
T-7	Control	45.78 (42.6)	45.39 (42.4)	43.88 (41.5)	41.38 (40.0)	44.11 (41.61)
SEm +_						0.34
CD at 5%						1.01
CV%						2.36

Figures in the parenthesis are arc sin transformed values

Table 4: Efficacy of foliar sprays on incidence of *Powdery mildew* (*Sphaerotheca* sp.) disease of Niger

Sr.No.	Treatment	Replication I	II	III	IV	Mean
T-1	Carbendazim 50%wp (0.1%)	7.60 (16.0)	6.92 (15.2)	7.42 (15.8)	8.12 (16.5)	7.52 (15.9)
T-2	Hexaconazole (0.1%)	8.40 (16.8)	8.62 (17.0)	7.98 (16.4)	8.46 (16.9)	8.37 (16.8)
T-3	Mancozeb (0.2%)	11.32 (19.6)	12.14 (20.3)	11.92 (20.1)	11.83 (20.1)	11.80 (20.0)
T-4	Propiconazole (0.1%)	8.05 (16.4)	7.33 (15.7)	8.21 (16.6)	7.68 (16.0)	7.82 (16.5)
T-5	WettableSulphur (0.2%)	5.98 (14.1)	6.24 (14.4)	5.78 (13.9)	6.18 (14.3)	6.05 (14.2)
T-6	Saaf, Carbendazim + Mancozeb (0.2%)	9.18 (17.6)	10.12 (18.5)	11.69 (19.9)	11.70 (20.0)	10.67 (19.0)
T-7	Control	18.32 (25.3)	19.69 (26.3)	18.33 (25.3)	17.68 (24.8)	18.51 (25.5)
SEm ±						0.31
CD at 5%						0.91
CV%						3.34

Figures in the parenthesis are arc sin transformed values; With regard to seed yield, treatment T6 (Carbendazim + Mancozeb 0.2%) gave significantly higher yield followed by the treatment T1 (Carbendazim 0.1%).

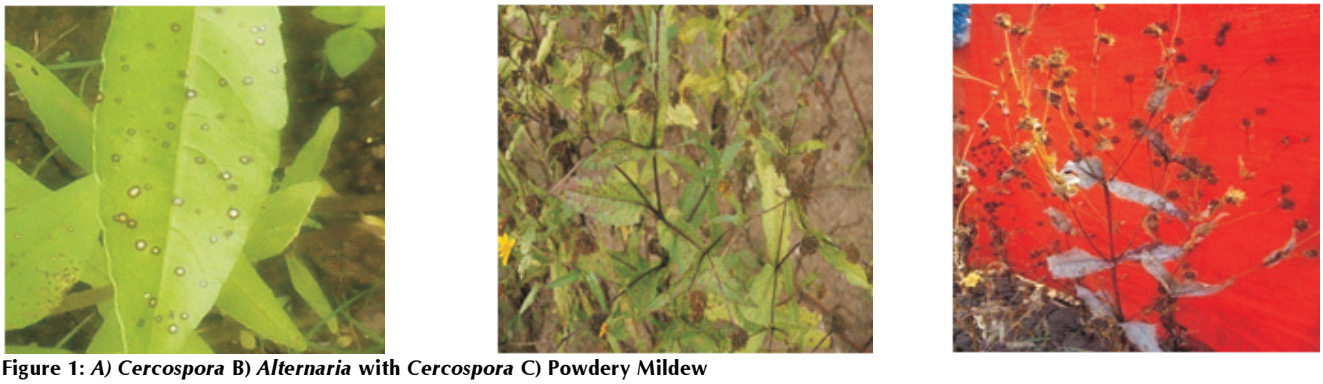

Figure 1: *A) Cercospora* B) *Alternaria* with *Cercospora* C) Powdery Mildew

0.1%) 17.01 PDI respectively (Table 3). Similarly, other fungicides were found superior over control. The present work was in agreement with the findings of Saharan *etal*. 2005 as two sprays of Zineb or Dithane M-45 at the rate of 0.3 per cent manages *Alternaria* disease. Spraying Mancozeb @ 0.2% at 15 days interval reported effectively (Hedge, 2005, Sandipan *et al*., 2014).Whereas, the least intensity of Powdery mildew disease 6.05 PDI was observed in T5 (Wettable sulphur 0.2%),

which was followed by T1 (Carbendazim 0.1%) 7.52 PDI and T4 (Propiconazole 0.1%) 7.82 PDI was observed (Table-4). The diseased can also be effectively controlled by spraying with sulfex at the rate of 0.3 percent as the disease starts appearing. Another spray can be after 10-15 days intervals depending upon the disease intensity (Sandipan *et al.*, 2014, Sharma, 1982 and Sharma, 1989).

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