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Field evaluation of fungicide, biotic and abiotic inducers for the management of *Alternaria alternata* leaf blight of sunflower

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Abstract

Leaf blight caused by *Alternaria alternata* is the major disease of sunflower affecting the successful cultivation across India. fungicides, biotic and abiotic inducers namely Propiconazole, Ginger, Salicylic acid, *Bacillus subtilis*, *Pseudomonas* sp, *Bacillus pumilus*, *Pseudomonas fluorescens*, Mancozeb in eight different treatment as spray and as seed treatment were evaluated against *Alternaria* leaf blight of sunflower at kadukanpalaym Erode district, Tamil Nadu. This experiment was carried out for 2019 during Kharif season. During 2019, the experimental results revealed that combination of seed treatment with entophytes *Pseudomonas* sp. 10g/kg of seed + foliar spray at 30 and 45 days after sowing recorded least per cent disease intensity with highest yield among all treatments.

Keywords: Sunflower, *Alternaria* leaf blight, *Alternaria alternata*, *Bacillus subtilis*, *Bacillus pumilus*, *Pseudomonas fluorescens* Salicylic acid, Ginger Propiconazole, Mancozeb, Management

Introduction

Sunflower is one of the major oil seed crops grown in India. Its production can be limited by leaf spot and blight disease caused by *Alternaria alternata*. This decreases seed germination and seedling survival (Udayashankar *et al.*, 2011) [11]. It causes severe leaf and stem spotting resulting in premature defoliation and stem breakage. High humidity and moderate to warm temperatures favor *Alternaria* leaf spot. Yield losses of 20 to 80%, with oil losses of 20 to 30%, have been reported from tropical and subtropical sunflower production regions. (Howard and Gent, 2007) [7]. In India, the losses due to *Alternaria* blight range upward to 80% (Shankergoud *et al.*, 2006) [10]. As there are no resistant variety or hybrid available against this disease. The present study was undertaken to evaluate the efficacy of different treatments for the management of leaf blight of sunflower.

Materials and Methods

A field experiment was conducted during Kharif season at kadukanpalaym Erode district Tamil Nadu. The experiment was laid out in Randomized block design with a hybrid CO₂, with eight different treatments and one check was maintained in three replications for kharif season. The plot size was maintained as 4.2x3 m with spacing of 60x30 cm. Two sprays were given. First spray was at 30 days after sowing and second spray was at 45 days after sowing. The treatments were as indicated in Table 1.

Ten plants were randomly selected from each plot and scored for the disease reaction at 15 days interval using 1-9 scale (Anonymous, 2006, DOR technical program) [5]. The data on seed yield were also recorded after harvesting. The per cent disease intensity (PDI) was calculated using the formula suggested by Mayee and Datar (1986) [8]. "The per cent disease control by different treatments over water sprayed control was computed and the economics of different treatments was worked out.

Results

During 2019, the treatment i.e., seed treatment with *Pseudomonas* sp (MN54433).10g /kg of seed and foliar application of *Pseudomonas* sp (MN54433). @0.2% resulted least per cent disease intensity (2.07%) with highest yield (2193 kg/ha), which was significantly superior to all other treatments. Followed by seed treatment with salicylic acid 0.50mM and 0.5mM foliar application salicylic acid resulted percent disease intensity (2.91%) with yield (2087.3). Seed treatment with *Bacillus pumillus* (MN53818) 10g/kg of seed + foliar application 45th and 60th DAS resulted percent disease intensity (4.76%) with yield (2075.3).

Seed treatment with Propiconazole 3ml/kg of seed + foliar application 45th and 60th DAS resulted percent disease intensity (7.99%) with yield (2051.7 kg/ha). Seed treatment with *Bacillus subtilis* 10g/kg of seed + 0.2% foliar application 45th and 60th DAS resulted percent disease intensity (12.56%) with yield (2046.0 kg/ha). Seed treatment with Ginger 10ml/kg of seed + 10% foliar application 45th and

60th DAS resulted percent disease intensity (14.64%) with yield (2034.7 kg/ha). Seed treatment with Mancozeb 2.5g/kg of seed + 0.3% foliar application 45th and 60th DAS resulted percent disease intensity (21.74%) with yield (1919.3 kg/ha). Among other treatments, Control has recorded significantly highest PDI (43.33%) with lowest yield (1919.3 kg/ha) among all other treatments.

Table 1: Effect of selected fungicides biotic and abiotic inducers on leaf blight disease management under field condition

S. No	Treatments	Disease severity%	Yield (kg/ha)
1	T1-Propiconazole-3 ml/kg of seed + foliar spray 250ppm after 45 th and 60 DAS	7.99 ^d	2051.7 ^{bcd}
2	T2-Ginger-10% -10ml/kg of seed+10% foliar spray after 45 th and 60 DAS	14.64 ^f	2034.7 ^d
3	T3-Salicylic acid - 0.50Mm seed treatment +foliar spray 10Mm after 45 th and 60 DAS	2.91 ^a	2087.3 ^b
4	T4-Endophytes- <i>Bacillus subtilis</i> (MN151077) - 10g/kg of seed+ foliar spray 0.2% after 45 th and 60 DAS	12.56 ^e	2046.0 ^{cd}
5	T5-Endophytes- <i>Pseudomonas</i> sp (MN154433) - 10g/kg of seed+ foliar spray 0.2% after 45 th and 60 DAS	2.07 ^a	2193.0 ^a
6	T6-Endophytes - <i>Bacillus pumilus</i> (MN153818) - 10g/kg of seed+ foliar spray 0.2% after 45 th and 60 DAS	4.760 ^c	2075.3 ^{bc}
7	T7- <i>Pseudomonas fluorescens</i> - 10g/kg of seed+ foliar spray 0.2% after 45 th and 60 DAS	4.150 ^b	2065.3 ^{bcd}
8	T8- Mancozeb - 2.5g/kg of seed+ foliar spray 0.3% after 45 th and 60 DAS	21.74 ^g	1997 ^e
9	Control	43.33 ^h	1919.3 ^f

*Values are mean three replications. Means in a column followed by same superscript letters are not significantly difference according to DMRT at $P \leq 0.05$

Discussion

In order to manage the most important disease of sunflower, *Alternaria* leaf blight, management practices were taken up and also to know the effective among the chemical fungicides, botanicals, and endophytes abiotic inducers tested. In the present investigation, it is evident that *Pseudomonas* sp. under study was found to be effective in controlling the disease, which in turn reflected on higher yield.

Among the *Pseudomonas* sp. Salicylic acid, recorded significantly lower per cent disease index (14.33) which was on par with *Pseudomonas* sp. (2.91%). The next best treatment was recorded as Salicylic acid (2.91% PDI). The highest per cent disease index was recorded in Mancozeb (21.74) (Fig. 15)

The sunflower yield was significantly superior in all the treatments as compared to untreated control. The results indicated that, all the *Pseudomonas* sp. under study have showed higher yield (2193 kg/ha) i.e., Salicylic acid (2087 kg/ha) followed by *Bacillus pumilus* (2075.3 kg/ha) and *Pseudomonas fluorescens* (2065.3 kg/ha). Next best treatments was viz., Propiconazole 0.3% (2051.7 kg/ha) and Ginger 10% (2034.7 kg/ha). The lowest yield was obtained in Mancozeb (1997.13 kg/ha) but it was found significantly superior over untreated control (1919.00 kg/ha).

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