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Evaluation of Neem oil with different Agro-chemicals against *Alternaria* leaf blight of bottle gourd incited by *Alternaria cucumerina* under field conditions

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Abstract

Bottle gourd (*Lagenaria siceraria*) is the most popular vegetables of the family cucurbitaceae, which forms an excellent diet being rich in vitamins iron and minerals. It is easily digestible and is used extensively as vegetable. Number of diseases such as *Alternaria* leaf blight, *Cercospora* leaf spot, powdery mildew, downy mildew and anthracnose. Among fungal diseases, *Alternaria* leaf blight and leaf spot caused by *Alternaria* spp. are the most important diseases of bottle gourd. Among seven Agro-chemicals evaluated against *Alternaria* Leaf Blight of Bottle Gourd under field conditions, Neem oil + Mancozeb proved to be most effective against the disease. Neem oil + Mancozeb proved to be most effective against *Alternaria cucumerina*, reducing the disease intensity and also yield was highly productive and was statistically significant. The maximum yield (kg/plant) in bottle gourd and B:C ratio was recorded in Neem oil + Mancozeb.

Keywords: *Alternaria*, mancozeb, neem oil, fungicides

Introduction

Bottle gourd (*Lagenaria siceraria*) belonging to the family Cucurbitaceae, is a climbing perennial plant widely cultivated round the year as a vegetable crop across the country. Bottle gourd is also known as the Calabash gourd, locally known as Doodhi in Gujrati, Bottle squash, White Flowered gourd (English name), Zucca melon, Trumpet gourd, Lauki and Ghiya (in Hindi). Bottle gourd originated in Africa and from there by floating on the seas, it travelled to India, where it has evolved into numerous local varieties, and has spread to China, Indonesia and far to New Zealand. Bottle gourd is a modest source of nutrients; it is very popular among a large section of people. The fruits contain 0.2% protein, 2.9% carbohydrates, 0.5% fat, 11 mg of vitamin C, thiamine (0.044 m.g), riboflavin (0.023m.g), niacin (0.33m.g), mineral matters (0.5%), and moisture (96.3%) per 100 g fresh weight (Desai and Musmade, 1998) [8]. It is grown in both rainy and summer season and its fruits available in the market throughout the year. Cucurbits are vegetable crops, comprising 118 genera and 825 species. Most of those species are eaten worldwide as food. It is the largest group of vegetables in summer season, of which more than 20 species are commercially grown in India (Choudhary *et al.*, 2002) [7]. Bottle gourd it has been found in wild form in South Africa and India. It is extensively grown throughout India occupying an area of 185 (000 ha) with a production of 3,142.71 (000MT). Bottle gourd is found to suffer by a number of diseases such as *Alternaria* leaf blight, *Cercospora* leaf spot, powdery mildew, downy mildew and anthracnose. Among the fungal diseases *Alternaria* leaf blight caused by *Alternaria cucumerina* is one of the most economically important in all regions wherever bottle gourd is grown (Maheshwari *et al.*, 2017) [11]. Symptoms first appear as small, circular and light to reddish brown spots, which latter enlarge in a concentric manner. Lesions often coalesce to form larger necrotic areas and in the center of the spot, olivaceous sporulation occurs. Keeping this in view, efforts have been made to find out the efficacy of various fungicides on the management of *Alternaria* leaf blight in bottle gourd.

Material and Methods

During *Zaid* season of 2022 a field experiment was carried at Central Research Field of Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. The experiment was laid out in RBD design with three replications and there were seven treatments.

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Highly susceptible bottle gourd cultivar S-1 for *Alternaria* leaf blight was sown in a plot size of 3m x 3m with recommended package of practices. Neem oil with various fungicides viz., Captan, Carbendazim + mancozeb, Hexaconazole, Tebuconazole, Imidacloprid, Fosetyl-Al were sprayed three times at 15 days interval starting from the initiation of the disease. Ten days after the second spray, five plants from each plot were selected and observations were recorded. The severity of the disease was assessed based on 0-9 scale and PDI has been calculated as per. Finally the fruit yield were recorded from each treatment and analysed statistically. The cost:benefit ratio was worked out based on the cost of fungicides, spray cost, yield and the market value of bottle gourd during 2022.

The disease intensity for *Alternaria* leaf blight was recorded by applying 0-9 disease rating scale given by James (1971), the details of the scale are as follows:

Scale	Description
0	No disease symptoms.
1	Small spots covering 1% or less leaf area.
3	Small spots (up to 5 mm in size) covering 1-10% of leaf area.
5	Spots enlarging and covering 11-25% of leaf area.
7	Spots coalesce to form big patches covering 26-50% of leaf area.
9	Big spots covering 51% or more of leaf area.

Percent disease index was calculated by using the following formula.

$$PDI = \frac{\text{Sum of disease rating}}{\text{Total no. of observations} \times \text{Highest disease grade}} \times 100$$

Yield (q/ha)

Total weight of harvested bottle gourd fruits per plot from all the pickings was calculated and finally the yield quintal per hectare was worked out.

Results and Discussion

During 2022, proportionately different fungicides controlled the disease effectively. Among the different Agro-chemicals, the percent disease index was significantly less (12.26 PDI) in Neem oil + Mancozeb sprayed plots followed by Neem oil + Tebuconazole (13.97 PDI) and Neem oil + Captan (15.04 PDI) as compared to other treatments and unsprayed control plot (18.12 PDI). The maximum yield and B: C ratio (115.64q/ha and 1:2.11) was recorded in plots that received Neem oil + Mancozeb spray followed by the Neem oil + Tebuconazole (112.40 q/ha with 1:2.04 B: C ratio) and Neem oil + Captan (106.31q/ha with 1:1.94 B: C ratio). All these findings are in accordance with other researchers viz., S. Vanitha *et al.* (2005) [22], showed that the fungicide mancozeb 0.2 per cent recorded the complete inhibition of mycelia growth and spore germination. Prasad *et al.* (2006) [17], evaluated three fungicides and five plant extracts against *Alternaria* leaf blight (*Alternaria cucumerina*) of bottle gourd. Spray of mancozeb (0.2%) was the best in reducing the disease severity and in increasing yield. Bagri *et al.* (2019) [4], D Mandal *et al.* (2019) [14], SA Ladumor *et al.* (2019) [10], showed Neem oil @2.5 + Mancozeb @1% is effective to control the *Alternaria* leaf blight of bottle gourd disease.

Table 1: Evaluation of different treatments on plant disease intensity and yield under field condition

Treatments	Disease intensity (%)			Yield q/ha	B:C ratio
	45 DAS	60 DAS	75 DAS		
T0 Control	18.12	29.15	37.31	94.30	1.78
T1 Neem oil @2.5 + Captan @1%	15.04	22.46	30.51	106.31	1.94
T2 Neem oil @2.5 + Mancozeb @1%	12.26	18.76	27.69	115.64	2.11
T3 Neem oil @2.5 + Hexaconazole 5% WP @0.1%	15.09	21.24	30.31	109.06	1.9
T4 Neem oil @2.5 + Tebuconazole @1%	13.97	20.97	30.52	112.40	2.04
T5 Neem oil @2.5 + Imidacloprid @1%	16.26	23.46	32.09	100.20	1.86
T6 Neem oil @2.5 + Fosetyl-Al @ 0.1%	15.82	23.14	33.27	103.15	1.88
Result	S	S	S	-	-
C.D	1.77	3.54	3.05	-	-
SE d (+)	0.816	1.627	1.402	-	-

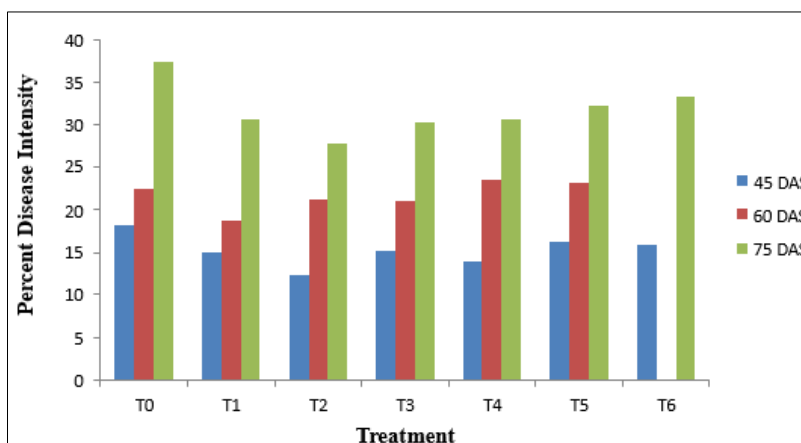


Fig 1: Evaluation of different treatments on plant disease intensity under field condition

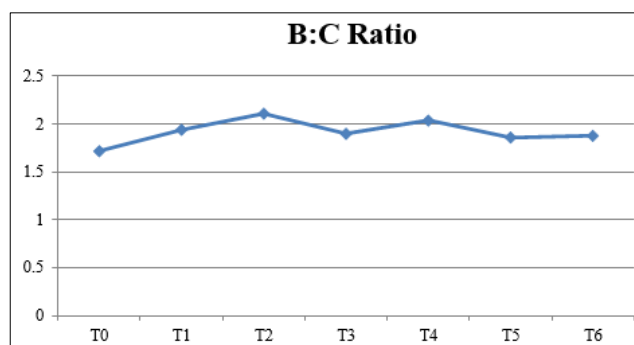


Fig 2: Evaluation of Benefit cost ratio of the treatments

Conclusion

One of the major constraints of bottle gourd is that, the crop is infected by large number of diseases of which *Alternaria* leaf blight is very common and destructive disease causing considerable damages to the crop. The aim of our study is to control the disease with the help of neem oil and Agro-chemicals. In which spray of neem oil with mancozeb (0.2%) was the best in reducing the disease severity and in increasing yield. Among the different Agro-chemicals, the percent disease index was significantly less (12.26 PDI) in Neem oil + Mancozeb sprayed plots followed by Neem oil + Tebuconazole (13.97 PDI) and maximum yield as well as B: C ratio (115.64 q/ha and 1:2.11) was recorded in plots that received Neem oil + Mancozeb spray followed by the Neem oil + Tebuconazole (112.40 q/ha with 1:2.04 B: C ratio).

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