*Research Paper :*

# Screening of fungicides against okra leaf spot under laboratory condition

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## SUMMARY

***Alternaria alternata* is a major constraint in economic production of okra crop. Alternaria leaf spot is always found associated at all the places and throught the crop season causing serious losses. To overcome this problem, screening of different fungisides against *A. alternata* has been tried, for inhibition of disease intensity. Therefore, an investigation was carried out on okra leaf spot to find out effective fungicides. Propiconazole (Tilt), difenconazole (Score) and hexaconazole (Contaf) all at three concentrations 250, 500, 1000 ppm and Copper oxychloride (Blitox) at three concentrations 1500, 2000, 2500 ppm while mancozeb (Dithane M-45) at 2500 ppm resulted cent per cent inhibition of the causative fungus.**

**Key words :** *Alternaria alternata*, Fungicides, Okra, Leaf spot

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Okra is an annual vegetable crop belonging to family Malvaceae. It is the most profitable summer vegetable. It occupies a place of prominence amongst summer vegetables in our country. Okra is cultivated extensively in tropical and subtropical parts of the world and is a commonly grown as vegetable in India. Its adaptability to a wide range of growing conditions makes it popular among vegetable growers. It is widely grown for its immature tender pod which is used as vegetable. Specific varieties are grown even in lower hills with moderate climate. It is also grown in Ethiopia, Africa, central America and other warmer regions of the world (Chadha, 2006).

Alternaria leaf spot caused by (*Alternaria alternata* (Fr.) Keissler and *A. tenuissima* is the major constraint in economic production of the crop (Singh, 1999). Alternaria leaf spot disease was always found associated at all the places and throughout the crop season causing serious losses. Meagre information the effect of fungicides agaiinst *Allernaria atternata* causing leaf spot in okra is available. So, an experiment was conducted on the efficacy of fungicides against this pathogen *in vitro*.

## MATERIALS AND METHODS

The screening of fungicides was performed in laboratory condition. Ten fungicides belonging to different chemical groups at three different concentrations (Table 1) were tested for their efficacy *in vitro* against *A. alternata* by poisoned food technique. The required quantities of each test fungicide were incorporated in conical flask containing 100 ml molten PDA medium so as to get required concentration in parts per million (ppm). The flask containing poisoned medium was well shaken to facilitate uniform mixing of fungicides and 20 ml was poured in each sterilized Petriplate. On solidification of the medium, the plates were inoculated in the centre by placing 5mm diameter mycelial culture block, cut aseptically with the help of cork borer from 10 days old pure culture of *A. alternata* grown on PDA. Three repetitions were kept for each concentration of respective fungicide. The inoculated plates were incubated at 27±2$^0$C. The required concentration in ppm was calculated based on active ingredient present in a formulation. The colony diameter of the fungus was recorded from three repetitions periodically. The per cent growth inhibition (PGI) was worked out by using the formula given by Vincent (1927).

$$PGI = \frac{100\,(DC - DT)}{DC}$$

where,

PGI = Per cent growth inhibition

DC = Average diameter of mycelial colony of control plate (mm)

DT = Average diameter of mycelial colony of treated plate (mm)

**Table 1: Screening of different fungicides against *A. alternata***

| Sr. No. | Technical and trade name of fungicide | Conc. (ppm) tried | Average colony diameter (mm) | Per cent growth inhibition over control | Sporulation |
|---|---|---|---|---|---|
| 1. | Carbendazim (12%) | 1500 | 8.17* ** (66.33) | 16.74 | +++ |
| | + Mancozeb (63%) | 2000 | 7.86 (61.33) | 23.01 | +++ |
| | (Sixer 75% WP) | 2500 | 7.67 (58.33) | 26.78 | ++ |
| 2. | Carbendazim | 250 | 7.58 (57.00) | 28.45 | +++ |
| | (Bavistin 50% WP) | 500 | 7.49 (55.67) | 30.13 | +++ |
| | | 1000 | 7.42 (54.67) | 31.38 | ++ |
| 3. | Chlorothalonil | 1500 | 7.29 (52.67) | 33.89 | ++ |
| | (Kavach 75% WP) | 2000 | 7.19 (51.33) | 35.56 | ++ |
| | | 2500 | 7.08 (49.67) | 37.66 | ++ |
| 4. | Propineb | 250 | 4.10 (16.33) | 79.50 | + |
| | (Antracol 70% WP) | 500 | 3.71 (13.33) | 83.26 | + |
| | | 1000 | 3.13 (9.33) | 88.28 | + |
| 5. | Tridemorph | 250 | 3.80 (14.00) | 82.43 | + |
| | (Calixin 80% EC) | 500 | 3.43 (11.33) | 85.77 | |
| | | 1000 | 3.13 (9.33) | 88.28 | |
| 6. | Mancozeb (Dithane M-45 75% | 1500 | 3.53 (12.00) | 88.94 | + |
| | WP) | 2000 | 2.91 (8.00) | 89.96 | - |
| | | 2500 | 0.71 (0.00) | 100.00 | - |
| 7. | Copper oxychloride (Blitox 50% | 1500 | 0.71 (0.00) | 100.00 | - |
| | WP) | 2000 | 0.71 (0.00) | 100.00 | - |
| | | 2500 | 0.71 (0.00) | 100.00 | - |
| 8. | Hexaconazole | 250 | 0.71 (0.00) | 100.00 | - |
| | (Contaf 5% EC) | 500 | 0.71 (0.00) | 100.00 | - |
| | | 1000 | 0.71 (0.00) | 100.00 | - |
| 9. | Difenconazole | 250 | 0.71 (0.00) | 100.00 | - |
| | (Score 25% EC) | 500 | 0.71 (0.00) | 100.00 | - |
| | | 1000 | 0.71 (0.00) | 100.00 | - |
| 10. | Propiconazole | 250 | 0.71 (0.00) | 100.00 | - |
| | (Tilt 25% EC) | 500 | 0.71 (0.00) | 100.00 | - |
| | | 1000 | 0.71 (0.00) | 100.00 | - |
| 11. | Control | - | 8.95 (79.67) | - | ++++ |
| | S.E. ± | | 0.03 | | |
| | C.D. (P=0.05) | | 0.10 | | |
| | C.V. % | | 1.72 | | |

* Figures are SQR + 0.5 transformed values
** Figures in parentheses are re-transformed values
Sporulation --- = No sporulation ++ = Moderate (6- 15), + = Poor (below 5)
+++ =Good (16-20) ++++ = Excellent (above 30)

## RESULTS AND DISCUSSION

Ten fungicides from systemic and non-systemic groups were evaluated at three different concentrations by poisoned food technique *in vitro* for their efficacy against *A. alternata*. The results presented in Table 1 indicates that fungicides have varied efficacy against *A. alternata*. Out of these, cent per cent inhibition of *A. alternata* was recorded with propiconazole (Tilt), difenconazole (Score) and hexaconazole (Contaf) at all three concentrations (250, 500, 1000 ppm) tried and copper oxychloride (Blitox) at all three concentrations (1500, 2000, 2500 ppm) while mancozeb (Dithane M-45) at 2500 ppm resulted cent per cent inhibition.

The next best in order of efficacy were mancozeb (Dithane M-45) at 2000 (89.96 %) and 1500 ppm (88.94 %). tridemorph (Calixin) at 1000 (88.28%), 500 (85.77 %) and 250 (82.43 %) ppm, propineb (Antracol) at 1000 ppm (88.28 %), propineb (Antracol) at 500 ppm (83.26 %) and at 250 ppm (79.50 %). Chlorothalonil (Kavach) was moderately effective while carbendazim (Bavistin)

and a product carbendazim + mancozeb (Sixer) were found least effective in growth inhibition as compared to other fungicides at all the three concentrations tried.

The spore formation was totally inhibited by propiconazole (Tilt), difenconazole (Score), hexaconazole (Contaf), Copper oxychloride (Blitox) at all the three concentrations and mancozeb (Dithane M-45) at 1500 and 2000 ppm concentrations. The next best in order of superiority was propineb (Antracol) at all the three concentrations and mancozeb (Dithane M-45) at 2000 and 2500 pm concentration.

It is evident from this result that, the growth inhibition increased with an increase in the concentration of chemicals. Propiconazole (Tilt), difenconazole (Score), hexaconazole (Contaf) and copper Oxycholoride (Blitox) followed by mancozeb (Dithane M-45) were significantly superior at all three concentrations over rest of the fungicides tested.

Earlier, Copper oxychloride (Pandey and Vishwakarma, 1996) and propiconazole (Sharma *et al.,* 2002), difenconazole and hexaconazole (Patel, 2008) have been reported the most effective fungicides against *A. alternata.* In present investigation also, propiconazole was found most effective fungicide. The results of earlier workers are also in agreement with the results obtained in the present investigations.

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