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# Response of different fungicide on purple blotch [*Alternaria porri* (Ellis) Cif] of onion

**Dinesh Kumar, SL Godara, AK Meena and BDS Nathawat**

## Abstract
A field experiment was carried out to the evaluate theeffect of different fungicideon purple blotch [*Alternaria porri* (Ellis) Cif] of onion (*Allium cepa* L.) experimental farm during *Rabi* 2015-16 and 2016-17 in the Department of Plant Pathology, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner. The experiment was laid-out in randomized block design with three replications. The effective management of purple blotch of onion through the application of different fungicides was appraised under field condition. Among the nine treatment evaluated, the seed treatment (ST) with Tebuconazole @ 1g/kg + two spray Tebuconazole @ 0.1% recorded significantly minimum percent disease index of 17.75% and bulb yield 26.83 t/ha which was superior over other treatment and control. However, the result shows that the application of tebuconazole was inhibited completely the mycelial growth of *Alternaria porri* at 100 and 200 ppm concentrations and *Azadirachtaindica* (Neem leaf extract) was found least effective at all concentrations against *Alternaria porri*. Moreover, the ST with Difenoconazole @ 1g/kg + two spray of Difenoconazole @ 0.1% (PDI 29.03% and Bulb yield 22.60 t/ha) recorded second best but it found statically at par with the application of ST with Tebuconazole + Trifloxystrobin @ 0.5g/kg + two spray Tebuconazole + Trifloxystrobin @ 0.05% (PDI 32.87% and Bulb yield 22.33 t/ha) and ST with Propiconazole @ 1g/kg + two spray of Propiconazole @ 0.1% (PDI 33.83% and Bulb yield 21.97 t/ha) in pooled analysis, respectively. The control was recorded higher PDI (74.00%) and minimum bulb yield (5.03 t/ha). The observation of this field is very useful to effective control of purple blotch disease of onion and in-vitro technique the different fungicide efficiently inhibits the per cent myceial growth.

**Keywords:** Onion, *Alternaria porrii*, fungicide, purple blotch

## Introduction
Onion (*Allium cepa* L.), the "queen of kitchen" is considered as the poor man's staple spice. It is one of the five most important fresh market vegetable crops grown worldwide belonging to the family alliaceae (Cramer, 2000) [2]. The primary centre of origin lies in central Asia and the major onion growing countries in the world are China, India, United States, Turkey, Iran and Pakistan (Javadzadeh *et al.*, 2009) [6]. Onion is an important temperate crop grown in the world. The vegetative growth of the crop is supported by lower temperature and short photoperiod whereas bulb development requires high temperature with longer photoperiod. Onion is grown in all types of the soil. The bulb of onion consists of swollen bases of green foliage leaves and fleshy scales. The major onion producing states are Maharashtra, Tamil Nadu, Andhra Pradesh, Bihar and Punjab. The crop is attacked by many fungal, bacterial pathogens, viruses and nematodes. The prevalence of pathogens depends on seasons, variety and region. Many fungal pathogens have been reported causing foliar and bulb diseases of onion. Management of purple blotch is essential to provide increased and stable onion yields throughout the onion growing regions. Control of purple blotch is primarily accomplished by the application by the application of fungicides and resistant cultivars. In India, many fungicides have been tested to manage this disease (Rangaswami, 1993, Patel *et al.*, 2001, Vijay and Rahman, 2004) [10, 9].

## Materials and Methods
The experiment was carried out at experimental farm during *Rabi* 2015-16 and 2016-17 in the Department of Plant Pathology, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner. Bikaner is situated at latitude $28^0$ 01ºN, longitude $73^0$ 22'E and an elevation of 234.7M above mean sea level. According to "Agro ecological region map" brought out by National Bureau of Soil Survey and Land Use Planning (NBSS& LUP), Bikaner falls in agro ecological region No. 2 (M9E1) under arid ecosystem (Hot Arid Eco-

region with desert and saline soil). The field experiment was laid out according to a randomized block design with three replications.

The experiment comprised of 9 treatments consisting (i) ST with Mancozeb @ 2g/kg + two spray of Mancozeb @ 0.3%, (ii) ST with Chlorothalonil @ 2g/kg + two spray of Chlorothalonil@ 0.2%, (iii) ST with Carbendazim + mancozeb @ 3g/kg + two spray of Mancozeb @ 0.3%, (iv) ST with Propiconazole @ 1g/kg + two spray of Propiconazole @ 0.1%, (v) ST with Difenoconazole @ 1g/kg + two spray of Difenoconazole @ 0.1%, (vi) ST with Tebuconazole @ 1g/kg + two spray Tebuconazole @ 0.1%, (vii) ST with Tebuconazole + Trifloxystrobin @ 0.5g/kg + two spray Tebuconazole + Trifloxystrobin @ 0.05%, (viii) ST with Tebuconazole + Trifloxystrobin @ 0.5g/kg + two spray Tebuconazole + Trifloxystrobin @ 0.05% and (ix) Control (without any treatment). However, the efficacy of fungicides was evaluated *in vitro* at four concentrations *viz.,* 1, 50, 100, and 200 ppm concentration against *Alternaria porri* on PDA by poisoned food technique. The crop was transplanted on Nov, 2015 and Nov, 2016 with 30 cm between the rows and 15 cm spacing within the plants. Different fungicides and plant extracts were sprayed 5 days after the inoculation, coinciding with the time of first appearance of the symptoms. Two subsequent sprays of chemicals and plant extracts were given at 10 days interval. Disease intensity was recorded after 15-20 days of second spray. Per cent disease control was calculated by following formula;

$$\text{Disease Control (\%)} = \frac{\text{PDI in control} - \text{PDI in treatment}}{\text{PDI in control}} \quad X\ 100$$

The data of per cent disease intensity in all the experiments were transformed to their Arcsine values (Fisher and Yates, 1963). The statistical analysis of the data of all the laboratory and green house experiments were done following Completely Randomized Design. The data of field experiments were analysed following Randomized Block Design (Cochran and Cox, 1957) [1].

## Results And Discussion

The efficacy of fungicides was evaluated *in vitro* at four concentrations *viz.,* 1, 50, 100, and 200 ppm concentration against *Alternaria porri* on PDA by poisoned food technique. The data suggested (Table 1 and Plate 1) that increase in concentration of fungicides caused increased inhibition of mycelial growth of the fungus. Among these, tebuconazole was inhibited completely the mycelial growth of *Alternaria porri* at 100 and 200 ppm concentrations, respectively. This was followed by Difenoconazole in with inhibition of 51.64, 89.01, and 91.18% at 50,100 and 200 ppm, respectively. *Azadirachtaindica* (Neem leaf extract)was found least effective at all concentrations against *Alternaria porri.* Similar results were observed by Vijaya and Rahman (2004) [12], Madhavi *et al.,* (2012) [8], Kumar *et al.,* (2017) [7], Roopa *et al*., (2014) [11] and Jakatimath *et al*., (2017) [5].

Eight different fungicides were evaluated for management of Purple blotch of onion by seedling treatment at the time of transplanting with two spray of same fungicide after 45 and 60 days, respectively, under artificial inoculated field conditions. Two years pooled results on per cent disease intensity revealed that all the fungicides were significantly effective in reducing purple blotch of onion over control (Table 2 and Fig. 1). The minimum disease intensity (17.75%) was recorded with the application of Tebuconazolewith 76.10 per cent reduction over control which increases the yield about 433.11%. However, Difenoconazolewere observed to be second best with 29.03 per cent disease intensity with 60.54 per cent decreased intensity which affect the yield about 349.01%. Chlorothalonil was found least effective with 54.83 per cent disease intensity and 25.92 per cent decreased intensity (Plate 10). Pooled analysis of two years yield data (Table 1) of onion was found statistically significant over control. Results showed that maximum yield (26.83 t/ha) was recorded in Tebuconazolewith 433.11 per cent increased yield followed by Difenoconazole with 22.60 t/ha and 349.01%, respectively. Least bulb yield was obtained with Chlorothalonil (14.08t/ha).Similar observation was also observed by Ginoya and Gohel (2015) [4] against *Alternariaalternata* causing fruit rot of chilli. Ilhe *et al.* (2008) also confirmed the efficacy of mancozeb 75 WP (0.25%) and tebuconazole 25 EW (0.05%) in controlling early blight of tomato. Alternate sprays of both the chemicals yielded in effective in controlling the disease with 71.08% disease. Our results corroborate with the result of Yadav *et al.* (2017) [13] revealed that all the fungicidal treatments were significantly superior to the untreated check in reducing the disease severity and increasing the bulb and seed yield of onion. Systemic triazole and strobilurin fungicides were found more effective as compared to non-systemic fungicides.

**Table 1:** Efficacy of different fungicides on mycelial growth inhibition against *A. porri in vitro*

| Fungicides | Per cent growth inhibition at | | | |
|---|---|---|---|---|
| | 1 ppm | 50 ppm | 100 ppm | 200 ppm |
| Mancozeb 75% WP | 6.30(14.54) | 41.76(40.26) | 65.66(54.13) | 68.70(55.98) |
| Chlorothalonil 75% WP | 4.23(11.87) | 38.62(38.42) | 62.88(52.46) | 66.10(54.39) |
| Carbendazim 12% + Mancozeb 63% | 10.44 (18.85) | 44.28 (41.72) | 71.88 (57.98) | 76.33 (60.89) |
| Propiconazole 25% EC | 13.86 (21.86) | 47.12 (43.35) | 79.77 (63.27) | 84.10 (66.50) |
| Difenoconazole 25% EC | 27.45 (31.60) | 51.64 (45.94) | 89.01 (70.64) | 91.18 (72.72) |
| Tebuconazole 25% EC | 29.16 (32.68) | 54.35 (47.50) | 90.00 (71.57) | 92.14 (73.72) |
| Tebuconazole 50% + Trifloxystrobin 25% | 25.23 (30.15) | 50.16 (45.09) | 88.86 (70.50) | 90.66 (72.20) |
| *Azadirachta indica*(Neem leaf extract) | 1.02 (5.80) | 35.26 (36.43) | 55.10 (47.93) | 58.26 (49.75) |
| Control | 0.00(0.00) | 0.00(0.00) | 0.00 (0.00) | 0.00 (0.00) |
| Mean | 13.08 (21.20) | 40.35 (39.44) | 67.02 (54.95) | 69.72 (56.61) |
| | S.Em (±) | | CD (P=0.05) | |

| | | |
|---|---|---|
| Fungicides | 1.80 | 4.99 |
| Concentrations | 1.20 | 3.33 |
| Fungicides X Concentrations | 3.61 | 9.98 |

**Table 2:** Effect of various treatments on per cent disease intensity of purple blotch and bulb yield of onion

| Tr. No. | Treatment details | Mean PDI | | | Per cent reduction over control | Bulb yield (t/ha) | | | Yield Increase (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | 2015-16 | 2016-17 | Pooled mean | | 2015-16 | 2016-17 | Pooled mean | |
| T1 | ST with Mancozeb @ 2g/kg + two spray of Mancozeb @ 0.3% | 49.67 (44.81) | 52.00 (46.15) | 50.83 (45.48) | 31.10 | 16.07 | 15.50 | 15.78 | 213.58 |
| T2 | ST with Chlorothalonil @ 2g/kg + two spray of Chlorothalonil @ 0.2% | 54.67 (47.68) | 55.00 (47.87) | 54.83 (47.77) | 25.92 | 14.57 | 13.60 | 14.08 | 179.80 |
| T3 | ST with Carbendazim + mancozeb @ 3g/kg + two spray of Mancozeb @ 0.3% | 43.33 (41.16) | 44.40 (41.78) | 43.87 (41.47) | 40.56 | 18.27 | 17.50 | 17.88 | 255.30 |
| T4 | ST with Propiconazole @ 1g/kg + two spray of Propiconazole @ 0.1% | 33.67 (35.46) | 34.00 (35.65) | 33.83 (35.55) | 54.22 | 22.63 | 21.30 | 21.97 | 336.42 |
| T5 | ST with Difenoconazole @ 1g/kg + two spray of Difenoconazole @ 0.1% | 29.73 (33.04) | 28.33 (32.16) | 29.03 (32.60) | 60.54 | 24.00 | 21.20 | 22.60 | 349.01 |
| T6 | ST with Tebuconazole @ 1g/kg + two spray Tebuconazole @ 0.1% | 18.33 (25.34) | 17.17 (24.44) | 17.75 (24.89) | 76.10 | 26.67 | 27.00 | 26.83 | 433.11 |
| T7 | ST with Tebuconazole + Trifloxystrobin @ 0.5g/kg + two spray Tebuconazole + Trifloxystrobin @ 0.05% | 32.00 (34.42) | 33.73 (35.50) | 32.87 (34.96) | 55.22 | 22.50 | 22.17 | 22.33 | 343.71 |
| T8 | Foliar spray of Fluopicolide 6.25% + Propamocarb hydrochloride 62.5% SC (W/V) | 43.00 (40.97) | 44.73 (41.97) | 43.87 (41.47) | 40.32 | 18.00 | 17.00 | 17.50 | 247.68 |
| T9 | Control (without any treatment) | 73.67 (59.17) | 74.33 (59.61) | 74.00 (59.39) | - | 4.90 | 5.17 | 5.03 | - |
| | S.Em (±) | 1.89 | 2.35 | 1.74 | | 1.24 | 0.73 | 0.80 | |
| | CD (P=0.05) | 5.51 | 6.85 | 5.07 | | 3.63 | 2.13 | 2.34 | |
| | CV (%) | 8.14 | 10.03 | 7.46 | | 11.56 | 7.08 | 7.62 | |

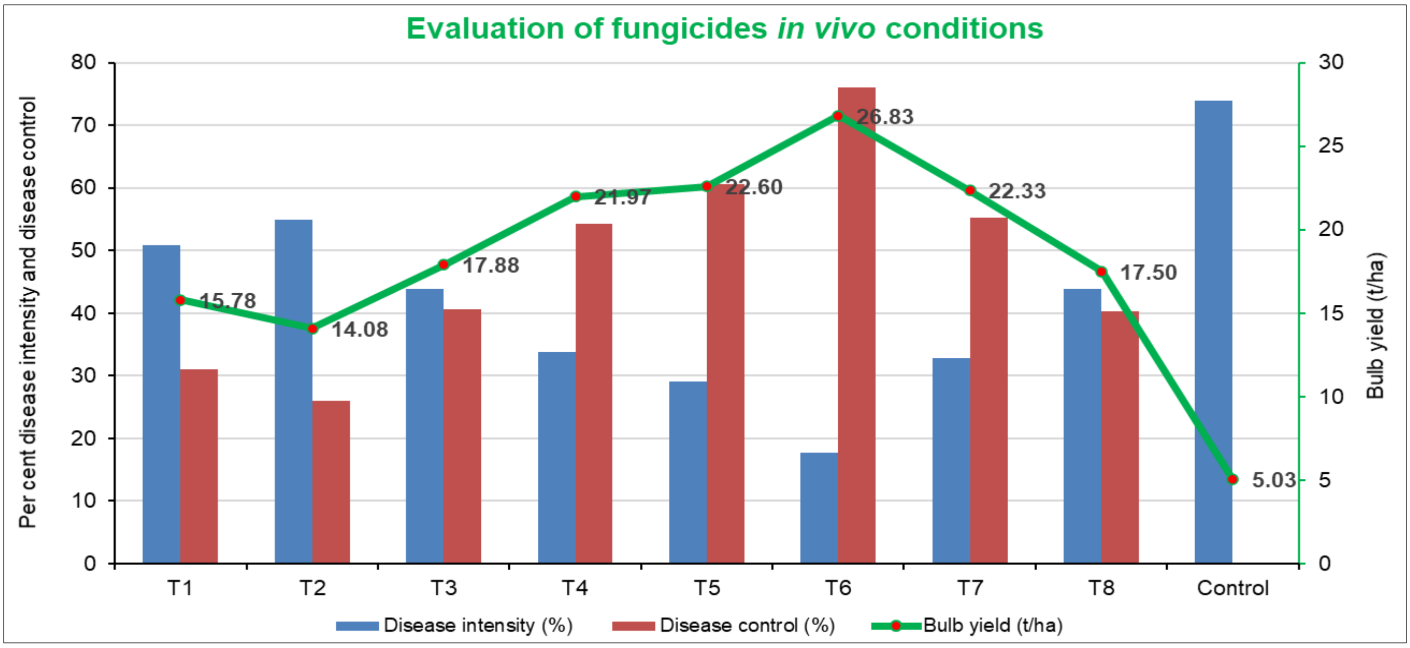


**Fig 1:** Effect of various treatments on per cent disease intensity, disease control of purple blotch and bulb yield of onion

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