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## Management of wilt of Udupi Mallige caused by *Fusarium solani* in coastal Karnataka

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#### Abstract

Jasmine is one of the important commercial flower crop of coastal Karnataka regarded as the queen of flowers and is called as "Belle of India" or the "Queen of fragrance" as it is highly scented to soothe and refresh. It is reported that there are 300 varieties of jasmine. Jasmine is a major traditional flower crop of our country. Although more than 2,000 species are known, 40 species have been identified in India and 20 species are cultivated in South India (Bhattacharjee, 1980). There are some other important cultivars like Mysore Mallige (*Jasminum grandiflorum*) and Hadagali Mallige (*Jasminum auriculatum*). Recently, Mysore Mallige, Udupi Mallige and Hadagali Mallige have been registered under the Intellectual Property Rights (Chaitanya *et al.*, 2018). Jasmine or Udupi mallige is affected by major fungal disease *i.e* wilt caused by *Fusarium solani* causing 60-70 per cent yield loss. From studies under taken for three years it is confirmed that soil drenching with fungicide Hexaconazole 5% EC @ 0.1% twice @ 20 days interval recorded lowest percent disease incidence *i.e* 11.68%, with highest per cent disease control (82.66%) which is on par with application of FYM enriched with consortia of bio-agents (*Trichoderma harzianum* + *Pseudomonas fluorescens*) @ 200 g recorded the 80.46% reduction over the untreated control with the highest yield 665.74 Kg/ ha and 608.08 Kg/ ha respectively.

**Keywords:** geographical indication, Atte, Chendu, Udupi Mallige, intellectual property right, per cent disease incidence and per cent disease reduction

#### Introduction

About 100 years ago the cultivation of Udupi Mallige started in Shankarapura of Udupi district. It is more concentrated in Udupi, Dakshina Kannada, Bhatkal, and Uttara Kannada. Udupi mallige found more economically viable and one of the prominent flower crop among all the three varieties. Jasmine is considered as the "Queen of fragrance" as it is extremely scented to soothe and refresh (Anon., 2013) [3]. In India it is called by different names such as, Mogra, Motia, Chameli, Malli puvvu, Jaati, Mallige, Juhi, Moonlight in the grove. It is reported that there are 300 varieties of jasmine cultivated in Karnataka. Several species of jasmine are grown such as Mysore Mallige (*Jasminum grandiflorum*), Hadagali Mallige (*Jasminum auriculatum*) and Udupi Mallige (*Jasminum sambac*) Krishnamurthy *et al.*, 1995 [7]. Jasmine is considered the queen of flowers and is called the "Belle of India" (Anon 2009). There are more than 2,000 species are known, among them 40 species have been recognized in India and 20 species have been cultivated in South India (Bhattacharjee, 1980) [5]. In coastal Karnataka usually farmers have small area of about 0.25 to 1 acre of land in front of the house for Jasmine growing (Shreeshail *et al.* 2018) [9]. Udupi Mallige also known as Shankarapura Mallige as it is concentrated in that area and popular in the region, for all these reasons Udupi Mallige has been tagged under Geographical Indication (GI) on 23rd December 2013 and the GI allotted number is 267103 (Chaitanya *et al.*, 2018, Anon., 2017) [6, 4]. This GI tag of the crop with brand name gives prominent way for export market and hence fetches remunerative price for the farmers. Recently, Mysore Mallige, Udupi Mallige and Hadagali Mallige have been registered under the Intellectual Property Rights (Anon., 2008) [1] Udupi Mallige belonging to family Oleaceae, commercial flower crop of coastal Karnataka (Shivakumar *et al.* 2016) [8].

Jasmine mainly affected by diseases like leaf spot caused by both *Cercospora* and *Alternaria* pathogens and wilt disease caused by *Fusarium solani*. As it is a high value crop fetches remunerative price for the farmers, incidence of wilt disease leads to yield loss up to more than 50 per cent if not managed in early stage. So with this brief background study was undertaken for three years on Management of wilt of Udupi mallige caused by *Fusarium solani* in coastal Karnataka at Shirva Udupi.

## Materials and Method

The research has been conducted at farmer field place Shirva, Udupi for the period of three years from 2016-18. A set inclusive of commercially available fungicides and bio-agents were evaluated against wilt of jasmine. The field trial was laid out in Randomized Complete Block Design (RCBD) with three replications. There were eight treatments inclusive of control. This experiment was conducted in established plots and followed by recommended horticultural practices like fertilizer management and other intercultural operations pruning were practised. The required quantities of the chemicals were weighed and suitably dissolved in a requisite quantity of water to get desired concentrations. Treatments

were imposed before the monsoon and after the monsoon in the month of September and October. A total of three soil drenching were taken at an interval of 20 days with the first drench before on set of monsoon. Observation were recorded and analysed with the help of statistical tools and pooled data were prepared and depicted in the table 4. Whole set of experiment was repeated for three years and individual year mean data was presented in the table format. Flower yield was recorded and analyzed statistically. Here in case of Udupi Mallige flower yield will be recorded in terms of Atte. Usually two flowering plants produces one Chendu, one Atte consists of 4 Chendu and each Chendu has 800 Flowers (Shreeshail *et al.* 2018)<sup>[9]</sup>.

Treatment details

| Sl. No. | Treatments  |
|---------|---|
| T1      | FYM ( <i>Trichoderma spp.</i> + <i>Pseudomonas spp.</i> ) |
| T2      | Captan 50 WP @ 0.2%                                       |
| T3      | Carbendazim + Mancozeb @ 0.25%                            |
| T4      | Copper oxy chloride @ 0.3%                                |
| T5      | Hexaconazole 5 EC @ 0.1%                                  |
| T6      | Propiconazole 25 EC @ 0.1%                                |
| T7      | Tebuconazole @ 0.1%                                       |
| T8      | Untreated control   |

## Results and Discussion

The experiment was carried out with eight treatments during 2016-18 to know the efficacy of fungicides and bio agents for management of wilt of jasmine under field condition. The results indicated that disease intensity in all the plots before the application of treatments were non-significant and significant difference among the treatments was observed after first spray.

From the Table 1. It can be concluded that drenching with Hexaconazole 5% EC @ 0.1% recorded lowest per cent disease incidence of 12.37 per cent which is on par with another tri-azole group of fungicide *i.e* Propiconazole 25% EC @ 0.1% recorded next lowest per cent disease incidence of 13.07 per cent. Where as in control 64.86 per cent of disease incidence was observed. But in the next year data it can be concluded that treatment T1(FYM enriched with bio-agents *Trichoderma harzianum.* + *Pseudomonas fluorescens*) @ 200 g recorded lowest per cent disease incidence and the same trend was observed in the next year also (Table 2).

From the Table 3. We can conclude that T4. Drenching with

Hexaconazole 5% EC @ 0.1% recorded lowest per cent disease incidence of 10.02% with maximum disease reduction of 85.34% this is followed by T1. FYM enriched with bio-agents *Trichoderma harzianum.* + *Pseudomonas fluorescens* @ 200 g depicted lower per cent disease incidence of 11.72 per cent, the data pertaining to the highest yield was recorded in T4. Hexaconazole 5% EC @ 0.1% *i.e* 764.21 Kg/ha followed by T1. Recorded yield of 620.50 Kg/ha.

And the same trend was observed for three years and pooled data were represented in the table 4. It can be concluded that drenching with Hexaconazole 5% E.C @ 0.1% recorded lowest per cent disease incidence of 11.68 per cent with highest yield 665.74 Kg/ha and also this treatment recorded highest cost benefit ratio of 4.60, this treatment is on par with the T1. *i.e* application of FYM enriched with Bio agents (*Trichoderma harzianum* + *Pseudomonas fluorescens*) @ 200 g recorded lowest per cent disease incidence of 13.16 per cent with highest yield of 608.08Kg/ha. This is followed by soil Drenching of Propiconazole 25% EC @ 0.1% recorded lowest PDI of 13.75 per cent with yield of about 590.00 Kg/ha.

**Table 1:** Management of wilt of Jasmine caused by *Fusarium solani* 2016

| Sl. No.        | Treatment details  | Pooled Per cent Disease Incidence(%) 2016 | Per cent Disease Reduction (%) | Yield (Kg/ha) 2016 |
|----------------|--|---|--------------------------------|--------------------|
| T <sub>1</sub> | FYM enriched with consortia of bio agents ( <i>Trichoderma harzianum.</i> + <i>Pseudomonas fluorescens</i> ) @ 200 g | 14.21 (22.15)*                            | 78.10                          | 614.20             |
| T <sub>2</sub> | Drenching of Captan 50 WP @ 0.2%   | 29.77 (33.08)                             | 54.11                          | 368.50             |
| T <sub>3</sub> | Drenching of Carbendazim + Mancozeb @ 0.25%  | 24.24 (29.51)                             | 62.63                          | 509.10             |
| T <sub>4</sub> | Drenching with Hexaconazole 5% EC @ 0.1%   | 12.37 (20.60)                             | 80.93                          | 627.35             |
| T <sub>5</sub> | Drenching of Propiconazole 25% EC @ 0.1%   | 13.07 (21.20)                             | 79.85                          | 596.50             |
| T <sub>6</sub> | Drenching of Tebuconazole @ 0.1%   | 15.52 (23.21)                             | 76.08                          | 585.63             |
| T <sub>7</sub> | Drenching with Copper oxy chloride @ 0.3%  | 30.21 (33.36)                             | 53.43                          | 416.00             |
| T <sub>8</sub> | Untreated control  | 64.86 (53.67)                             | 0.00                           | 206.69             |
|                | S. Em ±  | 0.57                                      |                                | 1.53               |
|                | *-Arc sign Transformation CD% (0.05)   | 1.41                                      |                                | 4.65               |

**Table 2:** Management of wilt of Jasmine caused by *Fusarium solani* 2017

| Sl. No.        | Treatment details   | Pooled Per cent Disease Incidence (%) 2017 | Per cent Disease Reduction (%) | Yield (Kg/ha) 2017 |
|----------------|---|--|--------------------------------|--------------------|
| T <sub>1</sub> | FYM enriched with consortia of bio agents ( <i>Trichoderma harzianum</i> . + <i>Pseudomonas fluorescens</i> ) @ 200 g | 13.55 (21.61)*                             | 80.33                          | 589.55             |
| T <sub>2</sub> | Drenching of Captan 50 WP @ 0.2%  | 27.80 (31.84)                              | 59.64                          | 410.87             |
| T <sub>3</sub> | Drenching of Carbendazim + Mancozeb @ 0.25%   | 24.61 (29.76)                              | 64.28                          | 510.17             |
| T <sub>4</sub> | Drenching with Hexaconazole 5% EC @ 0.1%  | 12.66 (20.86)                              | 81.62                          | 605.65             |
| T <sub>5</sub> | Drenching of Propiconazole 25% EC @ 0.1%  | 15.76 (23.40)                              | 77.13                          | 574.20             |
| T <sub>6</sub> | Drenching of Tebuconazole @ 0.1%  | 16.61 (24.06)                              | 75.89                          | 598.00             |
| T <sub>7</sub> | Drenching with Copper oxy chloride @ 0.3%   | 30.48 (33.53)                              | 55.76                          | 420.54             |
| T <sub>8</sub> | Untreated control   | 68.88 (56.12)                              | 0.00                           | 299.63             |
|                | S. Em ±   | 0.28                                       |                                | 2.62               |
|                | *-Arc sign Transformation CD% (0.05)  | 1.10                                       |                                | 7.93               |

**Table 3:** Management of wilt of Jasmine caused by *Fusarium solani* 2018

| Sl. No.        | Treatment details   | Pooled Per cent Disease Incidence (%) 2018 | Per cent Disease Reduction (%) | Yield (Kg/ha) 2018 |
|----------------|---|--|--------------------------------|--------------------|
| T <sub>1</sub> | FYM enriched with consortia of bio agents ( <i>Trichoderma harzianum</i> . + <i>Pseudomonas fluorescens</i> ) @ 200 g | 11.72 (20.03)*                             | 82.86                          | 620.50             |
| T <sub>2</sub> | Drenching of Captan 50 WP @ 0.2%  | 28.89 (32.53)                              | 57.73                          | 416.67             |
| T <sub>3</sub> | Drenching of Carbendazim + Mancozeb @ 0.25%   | 23.77 (29.20)                              | 65.22                          | 457.82             |
| T <sub>4</sub> | Drenching with Hexaconazole 5% EC @ 0.1%  | 10.02 (18.47)                              | 85.34                          | 764.21             |
| T <sub>5</sub> | Drenching of Propiconazole 25% EC @ 0.1%  | 12.41 (20.64)                              | 81.84                          | 616.78             |
| T <sub>6</sub> | Drenching of Tebuconazole @ 0.1%  | 14.06 (22.03)                              | 79.43                          | 602.75             |
| T <sub>7</sub> | Drenching with Copper oxy chloride @ 0.3%   | 30.07 (33.27)                              | 56.00                          | 436.54             |
| T <sub>8</sub> | Untreated control   | 68.34 (55.79)                              | 0.00                           | 292.45             |
|                | S. Em ±   | 0.51                                       |                                | 1.92               |
|                | *-Arc sign Transformation CD% (0.05)  | 1.64                                       |                                | 5.81               |

**Table 4:** Management of wilt of Jasmine caused by *Fusarium solani* 2016-18

| Sl. No.        | Treatment details   | Per cent Disease Incidence |               |               | Pooled        | Per cent disease Reduction* (%) | Yield (Kg/ha) 2016 | Yield (Kg/ha) 2017 | Yield (Kg/ha) 2018 | Pooled | B:C Ratio |
|----------------|---|----------------------------|---------------|---------------|---------------|---------------------------------|--------------------|--------------------|--------------------|--------|-----------|
|                |   | 2016                       | 2017          | 2018          |               |                                 |                    |                    |                    |        |           |
| T <sub>1</sub> | FYM enriched with consortia of bio agents ( <i>Trichoderma harzianum</i> + <i>Pseudomonas fluorescens</i> ) @ 200 g | 14.21 (22.15)*             | 13.55 (21.61) | 11.72 (20.03) | 13.16 (21.28) | 80.46                           | 614.20             | 589.55             | 620.50             | 608.08 | 3.85      |
| T <sub>2</sub> | Drenching of Captan 50 WP @ 0.2%  | 29.77 (33.08)              | 27.80 (31.84) | 28.89 (32.53) | 28.82 (32.49) | 57.21                           | 368.50             | 410.87             | 416.67             | 398.68 | 2.77      |
| T <sub>3</sub> | Drenching of Carbendazim + Mancozeb @ 0.25%   | 24.24 (29.51)              | 24.61 (29.76) | 23.77 (29.20) | 24.21 (29.49) | 64.06                           | 509.10             | 510.17             | 457.82             | 492.36 | 3.22      |
| T <sub>4</sub> | Drenching with Hexaconazole 5% EC @ 0.1%  | 12.37 (20.60)              | 12.66 (20.86) | 10.02 (18.47) | 11.68 (20.00) | 82.66                           | 627.35             | 605.65             | 764.21             | 665.74 | 4.60      |
| T <sub>5</sub> | Drenching of Propiconazole 25% EC @ 0.1%  | 13.07 (21.20)              | 15.76 (23.40) | 12.41 (20.64) | 13.75 (21.77) | 79.59                           | 560.00             | 574.20             | 590.00             | 574.4  | 4.03      |
| T <sub>6</sub> | Drenching of Tebuconazole @ 0.1%  | 15.52 (23.21)              | 16.61 (24.06) | 14.06 (22.03) | 15.40 (23.11) | 77.14                           | 512.00             | 534.00             | 550.00             | 532.0  | 4.09      |
| T <sub>7</sub> | Drenching with Copper oxy chloride @ 0.3%   | 30.21 (33.36)              | 30.48 (33.53) | 30.07 (33.27) | 30.25 (33.39) | 55.09                           | 416.00             | 420.54             | 436.54             | 424.36 | 2.81      |
| T <sub>8</sub> | Untreated control   | 64.86 (53.67)              | 68.88 (56.12) | 68.34 (55.79) | 67.36 (55.19) | 0.00                            | 206.69             | 299.63             | 292.45             | 266.26 | 2.19      |
|                | S. Em ±   | 0.57                       | 0.28          | 0.51          | 0.63          |                                 | 1.53               | 2.62               | 1.92               | 3.72   |           |
|                | *-Arc sign Transformation CD% (0.05)  | 1.41                       | 1.10          | 1.64          | 1.92          |                                 | 4.65               | 7.93               | 5.81               | 11.30  |           |

## Conclusion

From the study it can be concluded that drenching with Hexaconazole 5% E.C @ 0.1% managed the wilt up to 82 per cent when compared the control. As the fungus *Fusarium* is soil borne fungus soil drenching with fungicides helps to reduce inoculum load in the soil. And application of bio agents also reduced disease up to on an average of 80% when compared to the control.

**Fig 1a:** Field View of Udupi Mallige plot

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