Combi fungicide Trifloxystrobin 25%+Tebuconazole 50% WG against Early Blight Disease of Tomato

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A B S T R A C T

The experiment on management of early blight of tomato with the new combi molecule was conducted during Kharif 2018 in the bio-resource farm of Institute of organic farming, University of Agricultural Sciences, Dharwad. The new molecule and market sample of Trifloxystrobin 25%+Tebuconazole 50% WG, Azoxystrobin 23% SC, Copper Oxychloride 50% WP were evaluated against early blight incidence. The above chemicals sprayed two times at 15 days interval. The “new combi fungicide Trifloxystrobin 25%+Tebuconazole 50% WG at 350g and 400g are found promising in reducing the early blight disease and increasing the fruit yields as compared to the other treatments.

Introduction

The Tomato crop is grown for its edible fruits, which can be consumed either fresh or it can be processed to several products like puree, paste, soup, juices, ketchup, whole canned fruits etc. Early blight is caused by Alternaria solani which survive between crops on infected crop residues and on solanaceous host weeds. Early blight is common on tomatoes and potatoes, and it occasionally infects eggplants and peppers. Alternaria blight has been considered as the most common disease of tomato and other plants and causes heavy losses in quality of the fruits, thus rendering large quantity of tomato fruits unfit for consumption (Singh et al., 1997). It causes direct losses by the infection of fruits and indirect losses through leaf lesions, which reduce plant vigor. The disease is favored by warm temperatures and extended periods of leaf wetness from frequent rain, overhead irrigation, or dew. The fungal spores can be spread by wind and rain, irrigation, insects, workers, and on tools and equipment. Once the primary infections have occurred, they become the most important source of new spore production and are
responsible for rapid disease spread. Early blight can develop quickly mid- to late season and is more severe when plants are stressed by poor nutrition, drought, other diseases, or pests. Early blight is the most threatening disease (El-Abyad et al., 1993) of tomato, which causes great reduction in the quantity and quality of fruit yield. It is an important disease of tropical and sub-tropical areas. It is now found on all continents of the world. It is a serious disease in warm and humid regions (Sherf and MacNab, 1986). This disease, which in severe cases can lead to complete defoliation, is most damaging on tomato (Peralta et al., 2005).

In the absence of resistant cultivars, use of fungicides to manage the disease is an age-old practice. When there is outbreak of epidemic for any reason perhaps use of fungicides is one of the best options available. These fungicides have to be used judiciously according to the need and kind of organism involved. The evaluation of new chemical molecule for any disease management is the continuous process. If we use the same chemicals continuously the pathogen will develop resistance to the chemical and may not be able to give satisfactory control measures. Hence, an attempt has been made to evaluate new combi fungicide, against tomato early blight.

Materials and Methods

The experiment was conducted during Kharif 2018 in the bio-resource farm of Institute of organic farming, University of Agricultural Sciences, Dharwad. The bio-efficacy evaluation of Trifloxystrobin 25% + Tebuconazole 50% WG on tomato crop was carried out in randomized block design with seven treatments and three replications. The crop transplanting was done in well prepared field. All standard and recommended packages of agronomy practices such as spacing, fertilizers, irrigation, weeding was followed for cultivation of crop. The test fungicide was applied twice as foliar spray with knapsack sprayer at the interval of 15 days. The different treatments of the experiment are detailed in Table 1a and 1b.

Fruit yield also recorded after each picking. Data were analyzed adopting appropriate statistical design

Results and Discussion

Per cent disease incidence of early blight

The results of the experiment revealed that, the Trifloxystrobin 25%+Tebuconazole 50% WG market sample, Azoxystrobin 23% SC, Copper Oxychloride 50% WP were found to be significantly superior in reducing the early blight incidence (PDI) at both first and second sprays compared to untreated control. The disease progress was very rapid at 3 and 7 days after first spray, while after second spray the disease severity has reduced in all the treatments. The new molecule Trifloxystrobin 25%+Tebuconazole 50% WG was used at various concentrations 300g, 350g and 400g per hectare. After first spray the observations recorded at 3, 7 and 14 days are presented in Table 2. Among the different treatments Trifloxystrobin 25%+Tebuconazole 50% WG (350g), Trifloxystrobin 25%+Tebuconazole 50% WG (Market Sample) and Azoxystrobin 23% SC have recorded 32.40%, 26.18%, 29.15% and 31.61% respectively and they were found on par with each other. The highest incidence of early blight was recorded in untreated control plots (54.21%). The mean disease incidence ranged from 20.20 per cent to 35.21percent. After second spray the observations reordered are presented in Table 3. The results revealed that, Trifloxystrobin 25%+Tebuconazole 50% WG at 400g/ha has considerably reduced the
disease incidence (34.70%) after 14 days and found significantly superior to all the treatments. This is followed by Trifloxystrobin 25%+Tebuconazole 50% WG (300g), Trifloxystrobin 25% + Tebuconazole 50% WG (350g) and Trifloxystrobin 25%+Tebuconazole 50% WG (Market Sample) at 350g/ha. The maximum disease severity was recorded in untreated control (68.82%) plots. The mean disease severity varied between 31.33% and 62.28%.

Fruit Yields (t/ha)

The influence of new combi molecule Trifloxystrobin 25%+Tebuconazole 50% WG has reflected on yields and are presented in the Figure 1. The maximum yields (20.64 t/ha) are recorded in Trifloxystrobin 25%+Tebuconazole 50% WG (400g) which is followed by Trifloxystrobin 25%+Tebuconazole 50% WG (350g). However, Trifloxystrobin 25%+Tebuconazole 50% WG (350g) and Trifloxystrobin 25%+Tebuconazole 50% WG (300g) are found to be on par with each other. The treatments sprayed with Azoxytrobin 23% SC (500ml/ha) and Copper Oxychloride 50% WP (2500g/ha) were the next effective molecules. The lowest fruit yields (8.12t/ha) of was recorded in the untreated control plots.

![Fig.1 Symptoms of early blight on foliage of tomato crop](image)

| S. No. | Treatments                              | Dosage Formulation (g/ha) |
|-------|-----------------------------------------|---------------------------|
| 1     | Trifloxystrobin 25%+Tebuconazole 50% WG | 300 g                     |
| 2     | Trifloxystrobin 25%+Tebuconazole 50% WG | 350 g                     |
| 3     | Trifloxystrobin 25%+Tebuconazole 50% WG | 400 g                     |
| 4     | Trifloxystrobin 25%+Tebuconazole 50% WG | 350 g                     |
| 5     | Azoxytrobin 23% SC                     | 500 ml                    |
| 6     | Copper Oxychloride 50% WP              | 2500 g                    |
| 7     | Untreated control (water only)         | -                         |
Table 1b The Disease severity was recorded by using the following scale (Mayee and Datar, 1986)

| Score | Symptoms                                                                 |
|-------|--------------------------------------------------------------------------|
| 0     | No symptom on the leaf                                                   |
| 1     | Small irregular brown spots covering 1% or less of the leaf area         |
| 3     | Small, irregular, brown spots with concentric rings covering 1 – 10% of the leaf area |
| 5     | Lesions enlarging, irregular, brown with concentric rings, cover 11 – 25% of leaf area |
| 7     | Lesions coalesce to form irregular, dark brown patches with concentric rings covering 26 – 50% of leaf area. Lesions on stems and petioles |
| 9     | Lesions coalesce to form irregular, dark brown patches with concentric rings covering more than 51% of leaf area. Lesions on stems and petioles |

Table 2 Bio-efficacy of Trifloxystrobin 25%+Tebuconazole 50% WG against early blight disease of tomato (After first Spray)

| S. No. | Treatment                                      | Dose Formulation (g/ha) | Early blight disease severity (%) |
|--------|------------------------------------------------|--------------------------|-----------------------------------|
|        |                                                |                          | Before spray | 3 days after 1st spray | 7 days after 1st spray | 14 days after 1st spray | Mean    |
| 1      | Trifloxystrobin 25%+Tebuconazole 50% WG        | 300 g                    | 16.28 (23.79)* | 18.51 (25.47) | 25.32 (30.20) | 37.30 (37.63) | 27.04   |
| 2      | Trifloxystrobin 25%+Tebuconazole 50% WG        | 350 g                    | 14.06 (22.01) | 16.33 (23.83) | 21.10 (27.33) | 32.40 (34.68) | 23.28   |
| 3      | Trifloxystrobin 25%+Tebuconazole 50% WG        | 400 g                    | 15.54 (23.21) | 17.11 (24.42) | 21.33 (27.50) | 26.18 (30.76) | 21.54   |
| 4      | Trifloxystrobin 25%+Tebuconazole 50% WG (Market Sample) | 350 g | 11.10 (19.45) | 13.24 (21.33) | 18.21 (25.25) | 29.15 (32.66) | 20.20   |
| 5      | Azoxystrobin 23% SC                            | 500 ml                   | 15.54 (23.21) | 18.23 (25.27) | 24.51 (29.66) | 31.61 (34.20) | 24.78   |
| 6      | Copper Oxychloride 50% WP                      | 2500 g                   | 11.84 (20.12) | 12.54 (20.73) | 20.15 (26.66) | 35.08 (36.30) | 22.59   |
| 7      | Untreated Control (water spray only)           | -                        | 16.28 (23.79) | 19.21 (25.98) | 32.20 (34.56) | 54.21 (47.40) | 35.21   |

Values in parentheses are angular transformed values

S.Em.± 1.59 1.15 0.98 2.50
C.D. at 5% 4.76 3.38 2.67 7.52
C.V. % 12.40 8.80 9.10 5.77
Table 3 Bio-efficacy of Trifloxystrobin 25%+Tebuconazole 50% WG against early blight disease of tomato (After second Spray)

| S. No. | Treatment                                                      | Dose Formulation (g/ha) | Early blight disease severity (%) |
|--------|---------------------------------------------------------------|--------------------------|-----------------------------------|
|        |                                                               |                          | 3 days after 2nd spray | 7 days after 2nd spray | 14 days after 2nd spray | Mean |
| 1      | Trifloxystrobin 25%+Tebuconazole 50% WG (GSP Sample)         | 300 g                    | 37.98 (38.03)               | 40.88 (39.73)           | 42.18 (40.48)            | 40.35 |
| 2      | Trifloxystrobin 25%+Tebuconazole 50% WG                      | 350 g                    | 36.72 (37.28)               | 38.24 (38.18)           | 40.70 (39.62)            | 38.55 |
| 3      | Trifloxystrobin 25%+Tebuconazole 50% WG                      | 400 g                    | 28.10 (32.00)               | 31.20 (33.94)           | 34.70 (36.08)            | 31.33 |
| 4      | Trifloxystrobin 25%+Tebuconazole 50% WG (Market Sample)      | 350 g                    | 32.10 (34.50)               | 38.47 (38.32)           | 43.66 (41.34)            | 38.08 |
| 5      | Azoxystrobin 23% SC                                          | 500 ml                   | 34.23 (35.79)               | 46.64 (43.06)           | 54.02 (47.29)            | 44.96 |
| 6      | Copper Oxychloride 50% WP                                    | 2500 g                   | 39.22 (38.76)               | 45.21 (42.23)           | 57.72 (49.42)            | 47.38 |
| 7      | Untreated Control (water spray only)                          | -                        | 56.34 (48.62)               | 61.68 (51.73)           | 68.82 (56.03)            | 62.28 |

S.Em.± 0.91 1.19 1.44
C.D. at 5% 2.53 3.52 4.31
C.V. % 8.20 8.61 9.35

Values in parentheses are angular transformed value

Figure 1 Effect of Trifloxystrobin 25%+Tebuconazole 50% WG on Fruit yield of Tomato

The “new combi fungicide Trifloxystrobin 25%+Tebuconazole 50% WG at 350g and 400g are found promising in reducing the early blight disease of tomato as well as fruit yields. Although satisfactory control of the early blight disease by using various chemicals has been documented (Choulwar and Datar, 1988; Maheshwari et al., 1991; Abdul-Mallek et al., 1995), continuous use of agrochemicals for controlling the disease may
pose several problems like toxicity to non-target organisms, development of resistance in the populations of the pathogen and environmental pollution. Earlier workers reported application of fungicides is the most effective method for Alternaria blight control and found that Tetra methyl thiramdisulphide (TMTD), Dithane M-45, Bavistin, Dithane Z-78, Difolatan, Blitox, Captafol and Bordeaux mixture effectively manage the disease fungicides (Verma and Verma, 2010). Roopa et al., (2014) revealed that, among the five combi-fungicides evaluated, Hexazconazole 4% + Zineb 68% 72WP at 0.2 per cent (88.88%) was superior in inhibiting the mycelial growth over other treatments, which is on par with Carbendazim 12% +Mancozeb 63%) 75WP and Carbendazim 25%+ Iprodione 25% 50WP at 0.2 per cent. Least inhibition was observed in Captan 70% + Hexaconazole 5%) 75WP (54.81%) at 0.5 %.

The combination of trifloxystrobin and tebuconazole proved to be in synergy as the individual components have different modes of action. Tebuconazole, a triazole acts as demethylation inhibitor (DMI) in fungal sterol biosynthesis and is highly prone to cross resistance but it has an excellent broad spectrum activity to control the disease. The risk of cross resistance is regulated by using a component having a different mode of action. Trifloxystrobin, a Quinone outside Inhibitor (QoI) affects the mitochondrial respiration of the fungi (Pasche et al., 2004 and Ziegler et al., 2003). As trifloxystrobin decreased the transpiration rate, it was endowed with Chemical Science. The results of the research data conducted by Sharma et al., (2018) revealed that, Difenoconazole 25 EC @ 0.025 % (20.59) and Propiconazole were also found superior in managing the A. Solani of tomato. Saha et al., (2018), experimented Trifloxystrobin 25% + Tebuconazole 50%-75 WG molecule on Leaf Spot of Cabbage and found promising results.

Sreenivasulu et al., (2019), in their studies opined that the Tebuconazole 25.9 % EC @ 0.1% was most effective followed by propiconazole 25%EC @ 0.1% and copper oxychloride 50 % WP @ 0.30% less in found fairly economical for the management of early blight disease along with significantly highest fruit yield.

Thus, based on the above experimental results it is concluded that a new combi fungicide molecule Trifloxystrobin 25%+Tebuconazole 50% WG at 350g/h and 400g/h can be used as an alternate molecule as spray to successfully manage early blight disease and increasing the yields of tomato.

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