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Evaluation of bio-efficacy of tebuconazole 430SC against anthracnose (*Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc) disease of pomegranate

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Abstract

Pomegranate (*Punica granatum* L.) is an ancient and important fruit crop of the world belongs to the family Punicaceae and grown very well under arid regions of the world. Amongst various diseases infecting pomegranate, anthracnose caused by *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc. is one of the destructive disease both under field and storage conditions causing severe yield loss. In view of the importance of the disease, a field experiment was conducted on management of anthracnose disease using new fungicides during 2016-17 and 2017-18 at Horticulture Research and Extension Station, Vijayapur (Tidagundi). During 2016-17, Tebuconazole 430SC @ 0.8ml/l recorded least disease severity on leaves and fruits (PDI 7.43 & 2.45) and maximum marketable fruit yield (7.89 tones/ha) followed by Difconazole 25SC @ 1ml/l (PDI: 8.60 & 4.20, fruit yield: 7.83 tones/ha) and Propineb 70% WP@ 3g/l (PDI: 10.91 & 5.33, fruit yield: 7.02 tones/ha). Similarly during 2017-18 Tebuconazole 430SC @ 0.8ml/l was recorded least disease severity on leaves and fruits (PDI 8.60 & 5.33) and highest marketable fruit yield (6.47 tones/ha) followed by Difconazole 25SC @ 1ml/l (PDI: 9.63 & 6.33, fruit yield: 6.42 tones/ha) and Propineb 70% WP@ 3g/l (PDI: 10.47 & 9.83, fruit yield: 6.31 tones/ha).

Keywords: *Colletotrichum gloeosporioides*, 430SC, pomegranate

Introduction

Pomegranate (*Punica granatum* L.) is one of oldest cultivated species with high genetic diversity (Durgac *et al.*, 2008) [2]. At present 90 per cent of the world pomegranate production occurs in the northern hemisphere. The main producers are India, Iran, USA, Turkey, Spain and Israel (Citragold, 2011) [1]. Pomegranate is regarded as “fruit of paradise”. Pomegranate and its usage are deeply embedded in human history, and utilization is found in many ancient human cultures as food and as a medical remedy. Pomegranate juice, rich in B and C vitamins, calcium, sodium, potassium, iron, copper, chromium and fibers, is good for human health and prevents many diseases. In India, it is regarded as a “vital cash crop” grown in an area of 2.34 lakh ha with a production of 28.48 lakh tons and productivity of 12.17 tons/ha (NHB data, 2018) [6]. Among the different states growing pomegranate, Maharashtra is the largest producer occupying 2/3rd of total area in the country followed by Karnataka, Andhra Pradesh, Gujarat and Rajasthan. Karnataka state has the distribution of cultivating pomegranate under tropical condition in an area of 25.97 thousand ha with a production of 268.23 thousand tons (NHB, 2018) [6]. The crop is prone to many fungal diseases. Among various fungal diseases, anthracnose caused by *Colletotrichum gloeosporioides* (Penz.) Penz. And Sacc. is one of the most serious disease of pomegranate.

The disease symptoms mainly appears on leaves and fruits. The symptoms on leaves observed as pin head sized black to brown water soaked spots with circular margin. In advanced stage, these spots enlarge, coalesce and result in bigger patches. In severe cases, leaves dried up and drooped down. On fruits, brown spherical depressed spots occurs in a scattered form on the pericarp. In advanced stage, these spots coalesce to form necrotic patches over the surface of the fruit (Jayalaxami, 2010) [4]. It is one of the most destructive diseases of pomegranate inflicting considerable quantitative and qualitative losses. Considering the economic importance of the fruit crop as well as the disease, present investigation was undertaken for evaluation of new systemic fungicides for effective management of disease.

Materials and methods

Field experiment was conducted to evaluate tebuconazole 430 SC against anthracnose disease in pomegranate during Mrig bahar 2016-17 and 2017-18 at Horticulture Research and Extension Station, Vijayapur (Tidagundi). All the standard agronomic practices were followed as per the recommended package of practices of UHS, Bagalkot.

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The evaluation of tebuconazole 430 SC fungicide at different dosage (6.50, 7.00, 7.50 & 8.50ml/10 liters) along with standard check propineb 70% WP (30g/10 liter) and difenconazole 25% SC (10ml/10 liter) and untreated control against the anthracnose disease of pomegranate. The experiment was laid out in randomized block design (RBD) with seven treatments and three replications on five year old Bhagawa cultivar of pomegranate. Three plants in middle row were scored for the disease incidence. The treatments were initiated at the Disease Appearance Stage (DAS) *i.e* around two months after bahar treatment depending on visual symptoms of anthracnose disease. The required quantity of fungicide as per treatments were measured out/weighed with measuring cylinder/balance and suitably dissolved in a requisite quantity of water to obtain spray solution of desired concentration. Battery operated Knapsack sprayer was used for spraying. The observation was recorded at before first spray and later 10 days after each spray. Disease incidence on leaf and fruit was recorded using 0-5 scale.

Table 1.

Grade	Per cent area of infection	
	on leaf	on fruit
0	No infection	No infection
1	Up to 5	1-10
2	6-10	11-25
3	11-20	26-50
4	21-50	51-75
5	>50	>75

Further, the scored data were converted into Per cent Disease Index (PDI) using the formula given by Wheeler (1969)

$$\text{Per cent Disease Index (PDI)} = \frac{\text{Sum of individual disease ratings}}{\text{Number of leaf or fruit observed}} \times \frac{100}{\text{Maximum disease grade}}$$

The data was suitably transformed and analysed statistically. The number of healthy fruits per plant and fruit yield per plant in each treatments were recorded at harvesting stage and extrapolated the yield in terms tons per hectore and analyzed statistically.

Results and Discussion

First season (2016-17)

After 3rd spray, minimum disease index on leaf was recorded in treatment tebuconazole 430 SC@ 8.5ml/10 liter (7.43 PDI) which was on par with difenconazole 25% SC @ 10ml/10 liter (8.60 PDI) and tebuconazole 430 SC @ 7.5ml/10 liter (9.06 PDI) respectively.

However, the treatment tebuconazole 430 SC@ 8.5ml/10 liter was significantly superior over propineb 70%WP @30g/10 liter (10.9 PDI), tebuconazole 430 SC @ 7.00ml/10 liter (10.93 PDI) and tebuconazole 430 SC @ 6.5ml/ liter (11.33 PDI). Untreated control was recorded highest PDI of 16.64 per cent disease (table 1).

The incidence of anthracnose on fruit was significantly least in tebuconazole 430 SC@ 8.5ml/10 liter (2.45 PDI), difenconazole 25% SC @ 10ml/10 liter (4.20%) and tebuconazole 430 SC @ 7.5ml/10 liter (4.44 PDI), which were on par with each other. The treatment tebuconazole 430 SC@ 8.5ml/10 liter was significantly superior over tebuconazole 430 SC @ 7.00ml/10 liter (5.13 PDI), propineb 70%WP @30g/10 liter (5.33 PDI), and tebuconazole 430 SC

@ 6.5ml/ liter (6.87 PDI). Untreated control was recorded highest PDI of 22.02 per cent disease (table1).

Tebuconazole 430 SC @ 8.50ml/10 liter was recorded highest fruits per plant and yield per hectore (12.11kg: 7.89tons) as compare to difenconazole 25% SC @ 10ml/10 liter (11.91kg: 7.83tons) and tebuconazole 430 SC @ 7.50ml/10 liter (11.86kg: 7.15 tons). These treatments were statistically on par with each other. Untreated control recorded lowest fruits per plant and yield per hectore (4.90 kg: 3.07tons) (table 1).

Second season (2017-18)

During second season also the same trend was followed that, lowest anthracnose disease index on leaf was observed in tebuconazole 430 SC@ 8.5ml/10L (8.60 PDI) which was on par with difenconazole 25% SC @ 10ml/10L (9.63 PDI) and tebuconazole 430 SC @ 7.5ml/10L (10.10 PDI). However, the treatment tebuconazole 430 SC@ 8.5ml/10L was significantly superior over propineb 70%WP @30g/10L (10.47 PDI), tebuconazole 430 SC @ 7.00ml/10L (12.13 PDI) and tebuconazole 430 SC @ 6.5ml/L (13.23 PDI). Untreated control was recorded highest PDI of 30.63 per cent (table 2).

The disease index on fruit was significantly least in tebuconazole 430 SC@ 8.5ml/10 liter (5.33 PDI) which was on par with the difenconazole 25% SC @ 10ml/10L (6.33 PDI) and tebuconazole 430 SC @ 7.5ml/10 liter (7.59 PDI) respectively. The treatment tebuconazole 430 SC@ 8.5ml/10 liter was significantly superior over propineb 70%WP @30g/10 liter (9.83 PDI), tebuconazole 430 SC @ 7.00ml/10 liter (11.60 PDI) and tebuconazole 430 SC @ 6.5ml/ liter (11.93 PDI). Untreated control was recorded highest PDI of 24.20 per cent (table 2).

Tebuconazole 430 SC @ 8.50ml/10 liter was recorded highest fruits per plant and yield per hectore (9.93kg: 6.47 tons) as compare to difenconazole 25% SC @ 10ml/10 liter (9.76 kg: 6.42 tons) and tebuconazole 430 SC @ 7.50ml/10 liter (9.20 kg: 6.36 tons). These treatments were statistically on par with each other. Untreated control recorded lowest fruits per plant and yield per hectore (4.02 kg: 2.52tons). From the two years field study (2016-17 & 2017-18), new fungicide molecule tebuconazole 430 SC @ 7.5ml or 8.5ml/10 liter were recorded least disease incidence on leaf /fruit and maximum fruit yield per plant and per hectore (table 2).

The results were in agreement with the findings of Kumari *et al.* (2015) [5] reported that propiconazole (0.05%) and Carbendazim (0.05%) were highly effective in managing pomegranate anthracnose disease by recording 89.90 and 90.70 per cent and 89.50 and 90.30 per cent disease control on leaves and fruits, respectively. Jamadar and Patil (2007) [3] recorded that foliar application with difenconazole (Score 25EC) and prochloraz 45EC @1.0 ml/liter each resulted in the management of pomegranate leaf spot and fruit spot achieving more than 74.0 to 86.7 per cent reduction of the disease, respectively over unsprayed control. Spraying of Zineb (0.2%) or Chlorothanil (0.2%) at fortnightly intervals effectively controlled leaf spot and fruit rot disease in pomegranate (Rawal, 2006) [9]. Navale *et al.* (2009) [7] reported that, spraying of 0.1% difenconazole against *Colletotrichum gloeosporioides* causing anthracnose of pomegranate showed least per cent disease intensity, maximum percent disease control and highest fruit yield followed by 0.1% propiconazole. Patel *et al.* (2009) [8] reported that, carbendazim sprayed fruits showed highest per cent disease control over unsprayed fruits and propineb showed lowest percent disease control against *Colletotrichum gloeosporioides* of pomegranate.

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