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Bioefficacy of novel fungicide molecules in the management of false smut of rice caused by *Ustilaginoidea virens*

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Abstract
Field experiments were carried out to know the efficacy of seven novel fungicides and their application at different crop stages to manage false smut disease of rice during *kharif* 2017 and 2018. A variant with no application of fungicide was used as control. Pooled results of two season experiment indicated that foliar spray of trifloxystrobin 25% + tebuconazole 50% 75 WG (0.4 g l^{-1}) at booting or 50% panicle emergence (PE) was found to be effective in reducing per cent infected grains per panicle to the extent of 1.36 or 1.68. Per cent infected panicle per m^2 was 1.58 or 0.97 with the disease severity of 2.06 or 1.61 per cent that has also resulted in increased grain yield of 59.74 or 60.97 q ha^{-1} respectively. The other fungicides *viz*., tebuconazole 250 EC (1 ml l^{-1}), azoxystrobin 25 EC (1 ml l^{-1}) and propiconazole 25 EC (1 ml l^{-1}) at booting or 50% PE were found to be effective with per cent disease severity of 3.40 or 2.11, 2.68 or 2.70, 2.83 or 2.79 respectively when compared to untreated control (17.30 or 15.38%). The enhanced yield was noticed under different chemical treatments, which were superior over the untreated check under field condition.

Keywords: Rice, *Ustilaginoidea virens*, fungicides, disease severity

Introduction
False smut (pseudo-smut or green smut) disease caused by *Ustilaginoidea virens* (Cooke) (Takahashi) is a common grain disease in rice growing areas of the world. Earlier it was regarded as a minor disease, occurring sporadically in certain regions, but now epidemics of the disease are also reported in different parts of the world due to widespread cultivation of high fertilizer-responsive cultivars and hybrids, heavy application of nitrogenous fertilizer, and an apparent change in climate (Rush *et al*., 2000; Singh and Pophaly, 2010; Anon., 2016) [20, 22, 1]. In India, the disease has been observed in severe form since 2001 in major rice growing states, *viz*., Andhra Pradesh, Bihar, Gujarat, Haryana, Jammu and Kashmir, Jharkhand, Karnataka, Maharashtra, Puducherry, Punjab, Tamil Nadu, Uttar Pradesh and Uttarakhand (Dodan and Singh 1996, Mandhare *et al.,* 2008) [8, 14]. Disease incidence of 10-20, 5-85 and 4.44 to 17.12 per cent respectively has been reported from Punjab, Tamil Nadu and Karnataka on different rice cultivars (Ladhalakshmi *et al.,* 2012 and Muniraju *et al*., 2017) [13, 16]. Yield losses from 1.01 to 10.91 per cent and 0.09 to 4.25 per cent respectively have been reported (Atia, 2004 and Muniraju *et al*., 2017) [2, 16]. This loss in yield caused by rice false smut is attributed to both smut balls as well as chaffiness, reduction in grain weight and infertility of the spikelet near the smut balls. The efficacy of several fungicides against false smut has also been reported by various workers from different parts of the world. Mohiddin *et al.* (2012) [15] reported that prochloraz + carbendazim was effective against false smut. Pannu *et al.* (2010) [17] obtained reduction in false smut by spraying of copper oxychloride 50 WP (0.25%) at booting followed by propiconazole 25 EC (0.1%). Recently, Muniraju *et al*. (2017) [16] reported reduced disease incidence by the spray of azoxystrobin (18.2%) + difenconozole (11.4%). The present study was conducted to evaluate seven newer fungicides at three different crop stages against false smut of rice.

Material and Methods
Field experiments were conducted at Agricultural Research Station, Gangavathi, during *Kharif* 2017 and 2018 to identify the effective fungicide and stage of crop for chemical sprays in managing false smut of rice. The experiment was laid in split plot design with single spray of

seven fungicides *viz*., azoxystrobin 25 SC (1.0 ml l^{-1}), azoxystrobin 18.2% + difenconozole 11.4% w/w SC, metiram 55% WG + pyraclostrobin 5% WG, trifloxystrobin 25% + tebuconazole 75 WG (0.4 g l^{-1}), tebuconozole 250 EC (1.25 ml l^{-1}) and propiconazole 25 EC (1.0 ml l^{-1}) either at booting stage or 50 or 100 per cent panicle emergence stage. Rice variety BPT-5204 was used in the experiment where untreated check served as control. A total of seven treatments and a control were maintained in plots of 5 m × 4 m size, applied with recommended dose of fertilizers. The observations on per cent infected grains per panicle, per cent infected panicles per m^2 and grain yield data were recorded. The disease severity (%) was computed by using the formula

Disease severity (%) = Per cent smutted panicles per m^2 × Per cent smutted balls per panicle.

Results and Discussion

The data on different disease parameters is summarised in tables as shown below. There was significant difference among the treatments in false smut disease severity and yield. During 2017, different fungicidal sprays at different crop stages for the management of false smut of rice revealed that, the application of trifloxystrobin 25% + tebuconazole 75 WG (0.4 g l^{-1}) at booting or 50% PE was found to be very effective in minimising false smut; with least per cent of infected grains per panicle (1.63 or 1.73 at booting or 50% PE respectively) and infected panicles per m^2 (1.40% or 1.03% at booting or 50% PE, respectively). However, this was on par with the foliar application of tebuconozole 250 EC (1.25 ml l^{-1}) with 1.51 or 1.20 per cent infected grains per panicle and 1.76 or 1.72 per cent infected panicles per m^2 at booting or 50% PE respectively. Similar was the effect of spray of azoxystrobin 25 SC (1.0 ml l^{-1}) and propiconazole 25 EC (1.0 ml l^{-1}) on the per cent infected grains per panicle (1.69, 1.59 or 1.52, 1.82) and per cent infected panicles per m^2 (1.59, 1.54 or 1.77, 1.69 respectively) at booting or at 50% PE. However, in the control, higher percentage of infected grains per panicle (4.95 or 5.10) and infected panicles per m^2 (3.43% or 3.00%) were recorded (Table 1 & 2).

During 2018, the application of trifloxystrobin 25% + tebuconazole 75 WG (0.4 g l^{-1}) at booting or at 50% PE was found to be very effective in managing false smut with minimum per cent of infected grains per panicle (1.09 or 1.63) and infected panicles per m^2 (1.75% or 0.90%) at booting or 50% PE, respectively and was on par with the foliar application of tebuconozole 250 EC (1.25 ml l^{-1}) at booting or at 50% PE with 1.83 or 1.74 per cent infected grains per panicle and 2.37 or 1.23 per cent infected panicle per m^2. Untreated control has recorded the higher percentage of infected grains per panicle of 5.61 or 5.36 and per cent infected panicles per m^2 of 3.04 or 3.93. The results of pooled data revealed that the treatments were statistically significant. The application of trifloxystrobin 25% + tebuconazole 75WG (0.4 g l^{-1}) was effective in managing false smut with minimum per cent of infected grains per panicle (1.36 or 1.68 at booting or 50% PE, respectively) as well as infected panicles per m^2 (1.58% or 0.97% at booting or 50% PE, respectively) which was comparable to the foliar application of tebuconozole 250 EC (1.25 ml l^{-1}) with 1.67 or 1.47 per cent infected grains per panicle and 2.07 or 1.47 per cent infected panicles per m^2 at booting or 50% PE respectively. The application of azoxystrobin 25 SC (1.0 ml l^{-1}) and propiconazole 25 EC (1.0 ml l^{-1}) also showed on par result with the application of trifloxystrobin 25% + tebuconazole 75 WG with less per cent infected grains per panicle (1.72, 1.91 or 1.53, 1.96) and per cent infected panicles per m^2 (1.55, 1.50 and 1.87, 1.56) at booting or 50% PE respectively. These treatments showed significantly superiority over all other chemical treatments and control which has recorded higher percentage of infected grains per panicle (5.28 or 5.23) as well as per cent infected panicles per m^2 (3.32 or 3.02) (Table 1 and 2).

The disease severity recorded during 2017 indicated that, application of trifloxystrobin 25% + tebuconazole 75WG (0.4 g l^{-1}) at booting or at 50% PE was highly effective in the management of disease with least disease severity (2.30% or 1.78% at booting or 50% PE, respectively), followed by tebuconozole 250 EC (2.66% or 2.06%), azoxystrobin 25 SC (2.69% or 2.46%), and propiconazole 25 EC (2.68% or 3.07%). The highest percentage of disease severity was observed in untreated control (16.95 or 15.29). During 2018, the similar trend of results has been noticed with regard to the disease severity of false smut of rice. The pooled analysis on disease severity data revealed that, application of trifloxystrobin 25% + tebuconazole 75 WG (0.4 g l^{-1}) at booting or 50% PE was highly effective in managing the disease with the least disease severity of 2.06 at booting stage or 1.61 at 50% PE stage. The disease severity in all other treatments *viz*., tebuconozole 250 EC (3.40 or 2.11%), azoxystrobin 25 SC (2.68 or 2.70%) and propiconazole 25 EC (2.83 or 2.79%) were showing on par results with the treatment trifloxystrobin 25% + tebuconazole 75 WG (0.4 g l^{-1}) application. The control has recorded the highest per cent disease severity with 17.30% or 15.38% (Table 3).

Overall per cent of infected grains per panicle, infected panicles per m^2 and disease severity indicated that the sprays of fungicides at different crop stages showed significant difference between the fungicides and the control. As regards different crop stages for application of fungicides in managing false smut disease, booting or 50% PE stages are ideal for fungicidal sprays. A significant difference has been noticed amongst chemicals and also across crop stages.

The comparison of grain yield data revealed that, trifloxystrobin 25% + tebuconazole 75 WG (0.4 g l^{-1}) treated plot at booting or 50% PE stage has recorded the highest grain yield of 59.01 or 60.89 q ha^{-1} respectively during 2017 and which was on par with the treatments of tebuconozole 250 EC (59.29 or 59.96 q ha^{-1}), azoxystrobin 25 SC (59.85 or 59.70 q ha^{-1}) and propiconazole 25 EC (59.51 or 59.27 q ha^{-1}). But the significant results have also been noticed against the application of chemicals like azoxystrobin 18.2% + difenconozole 11.4% w/w SC, metiram 55% WG + pyraclostrobin 5% WG and carbendazim 12% + mancozeb 63% WP, and the control has recorded the least yield of 55.79 or 56.33 q ha^{-1}. Similar trend in results has been noticed during 2018 (Table 4). The pooled analysis of both the trials revealed that the spray with trifloxystrobin 25% + tebuconazole 75 WG (0.4 g l^{-1}) at 50% PE stage was effective in managing the disease with the highest grain yield of 60.97 q ha^{-1} that resulted in highest BC ratio of 1:2.13 and was followed by the application of tebuconozole 250 EC at 50% PE stage with the grain yield of 59.15 q ha^{-1} and BC ratio of 1:2.10.

The results of the present study clearly indicated that the foliar application of different fungicides in managing the false smut infection was effective when applied at the time of booting or at 50% PE and thus increased the grain yield from 55.79 to 59.01 q ha^{-1} or 56.33 to 60.89 q ha^{-1} respectively in 2017 and 55.40 to 60.48 q ha^{-1} or 55.40 to 61.05 q ha^{-1} during 2018 respectively. This reduced yield caused by false smut of

rice might be attributed to transformation of grains into smut balls as well as chaffiness, reduction in grain weight and infertility of the spikelet near the smut balls. Results of the present investigation are in agreement with the findings of many workers, where they have analysed the bio-efficacy of fungicides such as carbendazim and propiconazole (Dodan and Singh, 1997) [9], carbendazim (Hegde *et al.,* 2000) [10], propiconazole, carbendazim and tebuconazole (Bagga and Kaur, 2006) [5], propiconazole, carbendazim, tebuconazole and carbendazim + mancozeb (Paramjith and Sweety, 2006) [18], trifloxystrobin + tebuconazole, propiconazole (Chen *et al.*, 2013; Ladhalakshmi *et al.*, 2014 and Shivamurthy, 2017) [7, 12, 21] under field conditions. Even combi fungicides are better compared to the solo fungicides due to their broad range of action, lower doses and also lower risk of development of fungicide resistance in target fungal population. In rice, efficacy of such combi products in managing many fungal diseases has been reported (Bag and Saha, 2009; Bhuvaneswari and Raju, 2012; Kumar and Veerabhadraswamy, 2014 and Pramesh *et al.,* 2016) [3, 6, 11, 19]. In the present study, various combi and solo products such as trifloxystrobin 25% + tebuconazole 75 WG, tebuconazole 250 EC, azoxystrobin 25SC, propiconazole 25 EC showed their superior bio-efficacy in reducing false smut disease incidence and thus can be utilized under epidemic condition. In case of rice, varieties with resistance to false smut are still not in the hands of farmer. Moreover, bio-efficacy of the bio-control agents under severe epidemic condition is not demonstrated. Therefore, chemical management is an inevitable and ultimate means for disease management. Thus, cultural practices combined with foliar spray of fungicide is the only practice available to manage the disease and even in integrated pest management system need based application of fungicide has been recommended (Bag *et al.,* 2016) [4].

Conclusions

False smut of rice has emerged as one of the major threats to rice cultivation in India due to intensive methods of rice cultivation, over dependence on chemical fertilizers, changes in varietal profile and climatic condition. The present study provides a broad but relatively clear picture on the management of false smut of rice through prophylactic sprays of selected fungicides at different stages of crop growth. As the pathogen generally causes infection at the time of booting to panicle emergence, converting flowers into grain of smut ball. Hence, fungicidal sprays at booting or 50% PE prevents spore germination resulting in less disease. Among the different fungicides tested, trifloxystrobin 25% + tebuconazole 75 WG, tebuconozole 250 EC, azoxystrobin 25SC and propiconazole 25 EC were effective because of their broad spectrum activity, lower doses and also lower risk of development of fungicide resistance. With the knowledge from the present investigation, the disease can be effectively managed by taking a single spray of trifloxystrobin 25% + tebuconazole 75 WG or tebuconozole 250 EC or azoxystrobin 25SC or propiconazole 25 EC fungicides either at booting or at 50% PE stage.

Table 1: Efficacy of fungicides in reducing per cent false smut infected grains of rice.

Treatments		**Crop stages**								
Season		**2017**			**2018**			**Pooled**		
Fungicides	**Dosage**	**Booting**	**50%PE**	**100%PE**	**Booting**	**50%PE**	**100%PE**	**Booting**	**50%PE**	**100%PE**
Azoxystrobin 25SC (Amistar)	1.0 ml l^{-1}	1.69 (7.31)	1.59 (7.73)	2.25 (8.64)	1.75 (7.6)	2.23 (8.52)	2.83 (9.67)	1.72 (7.50)	1.91 (7.92)	2.54 (9.17)
Azoxystrobin 18.2% + Difenconozole 11.4%w/w SC (Amistar top)	1.0 ml l^{-1}	1.81 (7.73)	2.20 (8.45)	2.44 (9.00)	1.81 (7.73)	2.25 (8.63)	2.68 (9.36)	1.81 (7.73)	2.23 (8.56)	2.56 (9.18)
Metiram 55% WG + Pyraclostrobin 5% WG (Cabritop 60WG)	1.0 ml l^{-1}	2.21 (8.54)	2.82 (9.55)	1.94 (8.00)	2.05 (8.15)	2.20 (8.53)	2.45 (8.96)	2.13 (8.36)	2.51 (9.08)	2.19 (8.50)
Trifloxystrobin 25per cent + Tebuconazole (75WG)	0.4 g l^{-1}	1.63 (7.33)	1.73 (7.5)	2.48 (9.0)	1.09 (5.97)	1.63 (7.31)	1.48 (6.90)	1.36 (6.68)	1.68 (7.40)	1.98 (8.02)
Tebuconozole 250EC (Folicure)	1.25 ml l^{-1}	1.51 (7.05)	1.20 (6.28)	3.04 (10.04)	1.83 (7.69)	1.74 (7.59)	2.93 (9.79)	1.67 (7.42)	1.47 (6.97)	2.99 (9.94)
Carbendazim12% + Mancozeb63%WP(Companion)	2.0 ml l^{-1}	2.58 (9.25)	1.90 (7.88)	2.46 (9.02)	3.04 (10.04)	1.59 (7.14)	3.46 (10.64)	2.81 (9.65)	1.74 (7.52)	2.96 (9.87)
Propiconazole 25EC (Tilt)	1.0 ml l^{-1}	1.52 (6.68)	1.82 (7.73)	3.52 (10.80)	1.53 (7.11)	2.11 (8.15)	1.72 (7.52)	1.53 (7.10)	1.96 (7.97)	2.62 (9.30)
Untreated control		4.95 (12.85)	5.10 (13.05)	6.04 (14.20)	5.61 (13.64)	5.36 (13.29)	5.20 (12.88)	5.28 (13.27)	5.23 (13.21)	5.62 (13.70)

Figures in parentheses are--------

Season	**2017**		**2018**		**Pooled**	
Factors	**S. E(m)±**	**C.D. at 5%**	**S. E(m)±**	**C.D. at 5%**	**S. E(m)±**	**C.D. at 5%**
Fungicides (F)	0.58	1.97	0.51	1.73	0.25	0.83
Crop stages (C)	0.22	0.65	0.24	0.74	0.17	0.51
Factor(C)at same level of F	1.00	1.98	NS	NS	0.43	NS
Factor(F)at same level of C	0.77	2.48	NS	NS	0.46	NS

Table 2: Efficacy of fungicides in reducing per cent false smut infected panicles of rice.

Treatments	Crop stages								
Season	**2017**			**2018**			**Pooled**		
Fungicides	**Booting**	**50%PE**	**100%PE**	**Booting**	**50%PE**	**100%PE**	**Booting**	**50%PE**	**100%PE**
Azoxystrobin 25 SC (Amistar)	1.59 (7.16)	1.54 (7.12)	2.06 (8.26)	1.52 (7.03)	1.45 (6.79)	1.86 (7.81)	1.55 (7.16)	1.50 (7.02)	1.96 (8.04)
Azoxystrobin 18.2% + Difenconozole 11.4% w/w SC (Amistar top)	2.11 (8.33)	1.54 (7.05)	2.25 (8.62)	2.15 (8.34)	2.24 (8.42)	2.42 (8.84)	2.13 (8.39)	1.89 (7.76)	2.34 (8.74)
Metiram 55% WG + Pyraclostrobin 5% WG (Cabritop 60WG)	1.83 (7.76)	1.84 (7.74)	3.30 (10.40)	2.42 (8.92)	2.42 (8.95)	3.15 (10.19)	2.12 (8.37)	2.13 (8.39)	3.23 (10.23)
Trifloxystrobin 25 per cent + Tebuconazole (75 WG)	1.40 (6.78)	1.03 (5.80)	1.26 (6.43)	1.75 (7.57)	0.90 (5.44)	2.78 (9.51)	1.58 (7.19)	0.97 (5.63)	2.02 (8.12)
Tebuconozole 250 EC (Folicure)	1.76 (7.58)	1.72 (7.52)	1.37 (6.69)	2.37 (8.84)	1.23 (6.35)	1.90 (7.90)	2.07 (8.27)	1.47 (6.96)	1.63 (7.34)
Carbendazim12% + Mancozeb 63% WP(Companion)	1.73 (7.44)	2.35 (8.80)	2.60 (9.27)	2.25 (8.60)	2.50 (9.11)	2.79 (9.61)	1.99 (8.06)	2.42 (8.96)	2.69 (9.45)
Propiconazole 25 EC (Tilt)	1.77 (7.64)	1.69 (7.47)	1.44 (6.88)	1.96 (8.02)	1.43 (6.73)	2.25 (8.62)	1.87 (7.84)	1.56 (7.14)	1.84 (7.80)
Untreated control	3.43 (10.67)	3.00 (9.97)	2.74 (9.50)	3.21 (10.31)	3.04 (9.99)	3.93 (11.36)	3.32 (10.50)	3.02 (9.96)	3.34 (10.52)

Season	**2017**		**2018**		**Pooled**	
Factors	**S. E(m)±**	**C.D. at 5%**	**S. E(m)±**	**C.D. at 5%**	**S. E(m)±**	**C.D. at 5%**
Fungicides (F)	0.45	1.52	0.49	1.66	0.41	1.41
Crop stages (C)	0.23	0.72	0.23	0.71	0.16	0.48
Factor(C)at same level of F	0.77	NS	0.85	NS	0.72	NS
Factor(F)at same level of C	0.69	NS	0.73	NS	0.55	NS

Table 3: Efficacy of fungicides in reducing per cent severity of false smut of rice.

Treatments	Crop stages								
Season	**2017**			**2018**			**Pooled**		
Fungicides	**Booting**	**50% PE**	**100% PE**	**Booting**	**50% PE**	**100% PE**	**Booting**	**50% PE**	**100% PE**
Azoxystrobin 25SC (Amistar)	2.69 (8.83)	2.46 (9.01)	4.64 (12.44)	2.66 (9.57)	2.93 (10.34)	5.16 (11.59)	2.68 (8.55)	2.70 (9.23)	4.90 (12.75)
Azoxystrobin 18.2% + Difenconozole 11.4%w/w SC (Amistar top)	3.82 (11.27)	3.39 (10.17)	5.48 (13.48)	3.88 (11.79)	5.05 (12.42)	6.01 (13.17)	3.85 (11.43)	4.22 (11.66)	5.74 (13.83)
Metiram 55% WG + Pyraclostrobin 5% WG (Cabritop 60WG)	4.03 (11.59)	5.20 (12.61)	6.40 (14.48)	4.75 (12.21)	5.31 (11.95)	7.48 (13.76)	4.39 (11.44)	5.26 (12.90)	6.94 (15.08)
Trifloxystrobin 25 per cent + Tebuconazole (75WG)	2.30 (8.60)	1.78 (7.49)	3.13 (9.98)	1.83 (7.84)	1.44 (7.15)	3.75 (10.30)	2.06 (8.44)	1.61 (7.22)	3.44 (10.11)
Tebuconozole 250EC (Folicure)	2.66 (9.23)	2.06 (8.22)	4.15 (11.68)	4.14 (9.00)	2.17 (8.54)	5.35 (11.31)	3.40 (9.60)	2.11 (7.98)	4.75 (11.82)
Carbendazim 12% + mancozeb 63%WP (Companion)	4.46 (12.11)	4.45 (12.16)	6.39 (14.65)	6.88 (11.05)	3.98 (10.04)	9.52 (12.98)	5.67 (12.05)	4.22 (11.07)	7.96 (14.76)
Propiconazole 25EC (Tilt)	2.68 (8.90)	3.07 (10.07)	5.05 (12.94)	2.97 (9.50)	2.51 (9.54)	3.81 (10.78)	2.83 (9.82)	2.79 (9.62)	4.43 (12.55)
Untreated control	16.95 (24.30)	15.29 (22.97)	16.58 (23.57)	17.66 (22.16)	15.47 (21.55)	18.34 (21.06)	17.30 (24.22)	15.38 (22.88)	17.46 (23.40)

Season	**2017**		**2018**		**Pooled**	
Factors	**S. E(m)±**	**C.D. at 5%**	**S. E(m)±**	**C.D. at 5%**	**S. E(m)±**	**C.D. at 5%**
Fungicides (F)	0.67	2.26	0.60	2.04	0.33	1.11
Crop stages (C)	1.15	0.65	0.17	0.50	0.16	0.48
Factor(C)at same level of F	2.26	NS	1.04	NS	0.57	1.42
Factor(F)at same level of C	NS	NS	0.711	NS	0.49	1.56

Table 4: Efficacy of fungicides against false smut in enhancing yield (q ha^{-1}) of rice.

Treatments	Crop stages											
Season	**2017**			**2018**			**Pooled**			**BC Ratio**		
Fungicides	**Booting**	**50% PE**	**100% PE**	**Booting**	**50% PE**	**100% PE**	**Booting**	**50% PE**	**100% PE**	**Booting**	**50% PE**	**100% PE**
Azoxystrobin 25SC (Amistar)	59.85	59.70	58.94	59.45	58.63	56.98	59.65	59.16	57.96	2.00	1.98	1.94
Azoxystrobin 18.2% + Difenconozole 11.4%w/w SC (Amistar top)	59.48	58.95	58.18	57.65	57.70	57.25	58.56	58.33	57.71	1.96	1.95	1.93
Metiram 55% WG + Pyraclostrobin 5% WG (Cabritop 60WG)	58.10	57.65	56.43	57.18	56.90	57.43	57.64	57.28	56.93	2.02	2.01	2.00
Trifloxystrobin 25 per cent + Tebuconazole (75WG)	59.01	60.89	58.90	60.48	61.05	58.65	59.74	60.97	58.77	2.08	2.13	2.05
Tebuconozole 250EC (Folicure)	59.29	59.96	58.69	59.00	59.53	57.75	59.15	59.74	58.22	2.07	2.10	2.04

Carbendazim + Mancozeb (Companion)	59.52	58.91	56.74	59.08	59.13	56.89	59.30	59.02	56.81	2.07	2.06	1.99
Propiconazole 25EC (Tilt)	59.51	59.27	57.51	58.97	58.99	58.75	59.24	59.13	58.13	2.10	2.09	2.06
Untreated control	55.79	56.33	57.89	54.40	55.40	55.35	55.10	55.87	56.62	2.02	2.05	2.08

	2017		2018		Pooled	
Factors	**S. E(m)±**	**C.D. at 5%**	**S. E(m)±**	**C.D. at 5%**	**S. E(m)±**	**C.D. at 5%**
Fungicides (F)	0.06	0.22	0.60	2.04	0.30	1.00
Crop stages (C)	0.07	0.22	0.17	0.50	0.10	0.31
Factor(C)at same level of F	0.11	0.63	1.04	NS	0.51	0.95
Factor(F)at same level of C	0.18	0.55	0.71	NS	0.38	1.23

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