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BIO-EFFICACY OF NEWER FUNGICIDE TRIFLOXYSTROBIN 25% PLUS TEBUCONAZOLE 50% WG (NATIVO 75 WG) AGAINST ANTHRACNOSE LEAF SPOT AND POD BLIGHT OF SOYBEAN

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ABSTRACT
Evaluation of the efficacy of trifloxystrobin 25% + tebuconazole 50% (Nativo 75 WG) against *Colletotrchum truncatum* causing anthracnose leaf spot and pod blight disease and investigation on phytotoxicity of the fungicide on soybean were carried out during experimentation. Summarisation of results indicated that two foliar sprays of trifloxistrobin 25% + tebuconazole 50% @ 350g/ha, first at the time of appearance of the disease and second its 14 days later was found to be the best provided 78.06% disease control and recorded highest grain yield (1059.26kg/ha) and increase in grain yield (62.87%). However, it was found to be significantly at with the same fungicide applied @ 300g/ha, provided 74.86% control of the disease and recorded 60.31% increase in grain yield over control. Moreover, the chemical was found to be safe as no phytotoxic effect of test fungicide was noticed on soybean even at the highest dose (1400g/ha) tested.

INTRODUCTION

Soybean (*Glycine max* (L.) Merr.) known as 'Golden bean' and 'miracle crop' of 20th century, suffers from severe yield losses due to several diseases as more than 250 plant pathogens have been reported to affect soybean. Among them anthracnose caused by *Colletotrichum truncutum* (Schw) Andrus and Moore is a serious disease in almost all soybean growing areas of the world including India causing qualitative as well as quantitative losses to the tune of 16-100 per cent (Sinclair, 1992; Mittal *et al.*, 1993; Anonymous, 1999; Chandrasekaran and Rajappan, 2002, Kumar and Dubey 2006 & 2007a&b). Since, most of the present day cultivars lack resistance to anthracnose; the use of fungicides can be effective (Backman *et al.*, 1979, 1982) means of disease management. Various classes of fungicides, including strobilurins and triazoles are labelled in the United States for managing this disease (Bester *et al.*, 2014). However, in India, only Tebuconazole 10% WP + Sulphur 65% WG and Hexaconazole 5% EC have been registered with the Central Insecticide Board (CIB) for the management of leaf spot or pod blight and rust on soybean, respectively. Currently, much attention and efforts on anthracnose control has concentrated on the use of fungicides. Long term use of these fungicides may lead to the development of disease resistant strains. Therefore, there is a need to seek for alternative fungicide(s) active ingredient in order to sustain the national production of soybean. One of the potential newly developed fungicides that can be used to control anthracnose disease in soybean is Nativo 75 WG. This chemical, is a broad spectrum synthetic fungicide which content two active ingredients (trifloxystrobin and tebuconazole) used to control a wide range of fungal diseases. There are many reports on efficacy of trifloxystrobin against plant diseases such as gray mold (*Botrytis cinerea*) of fruits and vegetables, leaf spot (*Cercospora beticola*) and powdery mildew (*Erysiphe betae*) of sugarbeet, black spot (*Guignardia citricarpa*) of citrus, postharvest rot (*Colletotrichum gloeosporioides*) of avocado (Ziegler *et al.*, 2004; Hadden and Black, 1898; Lewis and Miller, 2002; Slawecki *et al.*, 2002; Anesiadis *et al.*, 2003). Tebuconazole is another broad spectrum fungicide that is widely used for controlling fungal diseases of fruits and vegetable crops. It gives effective control of black pepper anthracnose disease (Anonymous, 2012). The combination product, trifloxystrobin 25% + tebuconazole 50% (Nativo 75 WG), can be an excellent tool for protecting soybean from anthracnose disease. This product has been registered in India with the CIB for application against sheath blight, leaf, neck blast, glume discoloration (dirty panicle), false smut and brown leaf spot on rice and early blight on tomato, but not against anthracnose leaf spot and pod blight of soybean. Therefore, present study was conducted with the purpose to evaluate the fungicide against anthracnose leaf spot and pod blight of soybean.

MATERIALS AND METHODS

Efficacy of trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) against anthracnose leaf spot/pod blight in soybean

The experiment was conducted at Norman E. Borlaug Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar during *kharif* 2014 and 2015 crop seasons to evaluate the efficacy of trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) against anthracnose leaf spot and pod blight of soybean. The experiment was laid out in a Randomized Block Design (RBD) with three replications and eight treatments. Variety PS 1092 was sown on 12.08.2014 and 09.08.2015 having 10 rows of 5 meters length at 45 cms row to row distance. The crop was raised as per the recommended package of practices and protective irrigation was given as and when required. Fungicides were sprayed twice using a hand operated knapsack sprayer fitted with hollow cone nozzle and water volume of 500 lit/ha was maintained. Treatment details are given in Table 1a.

First spraying was given just after the appearance of the disease and second was given 14 days after the first spray. Observations on diseases were recorded before spray (pre-treatment), 3, 7 and 10 days after each spray. During 2014, sprayings were made on 1st and 15th September, while in 2015 crop season on 13th and 27th September.

Anthracnose was assessed according to the disease rating scale described by Mayee and Datar (1986) where, 0 = no symptoms, 1 = spots covering 1% or less leaf area, 2 = spots covering 1-10% of leaf area, 3 = spots covering 11-25% of leaf area, 4 = spots covering 26-50% of leaf area and 5 = spots coalescing covering above 51% of leaf area.

For scoring the intensity of anthracnose leaf spot and pod blight disease, five plants per treatment per replication were selected randomly and tagged for recording the observations. Three trifoliate leaves (bottom, middle and top) from main branch on each observation per plant were selected for recording observations and per cent disease intensity/ index was worked out as per the procedure given by Mayee and Datar, 1986.

PDI = (Sum of numerical ratings/Total no. of samples × Maximum rating scale) × 100

Matured and dried plants were harvested at physiological maturity of the crop. Total number of pods per plant, number of infected and healthy pods, grain yield and per cent pod blight incidence/infection were recorded. Grain yield were recorded in all the treatments and it was computed on hectare basis.

Evaluation of phytotoxicity of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) on soybean

Variety PS 1092 was used to evaluate the phytotoxicity of trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG). One spray was given when spotting was noticed. The treatment details are given below:

Visual observations were recorded at 1, 3, 7 and 10 days after spray of test products. Ten plants per plot were randomly selected and phytotoxicity symptoms viz; leaf chlorosis, tip burning, necrosis, epinasty, hyponasty, vein clearing, wilting and rosetting were recorded as per CIB guidelines using a rating scale of 0 – 10 (Muthukumar and Udhayakumar, 2015, Kumar, 2018) where, 0= no phytotoxicity, 1= 1-10% phytotoxicity, 2= 11-20% phytotoxicity, 3= 21-30% phytotoxicity, 4= 31-40% phytotoxicity, 5= 41-50% phytotoxicity, 6= 51-60% phytotoxicity, 7= 61-70% phytotoxicity, 8= 71-80% phytotoxicity, 9= 81-90% phytotoxicity and 10= 91-100% phytotoxicity.

Treatment details	Dosage g. a.i./ ha	Forml./ha (gm)
Untreated control (water spray)	-	-
Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG)	87.5 + 175	350
Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG)	175 + 350	700
Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG)	350 + 700	1400

The crop was harvested at maturity and the net plot yield was recorded it was further converted into hectare basis. The crop was harvested on November 14, 2014 and November 6, 2015.

RESULTS AND DISCUSSION

Effect of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) against anthracnose leaf spot of soybean

The data presented in Table 1b revealed that during 2014, anthracnose leaf spot severity 3, 7 and 10 Days after first and second sprays ranged from 10.55 to 40.89 per cent. Pooled analysis of anthracnose leaf spot severity 3, 7 and 10 Days after first and second sprays indicated that all the treatments significantly reduced the disease severity as compared to control. Among the different treatments, trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha which recorded 12.37 PDI, was found to be the best in reducing the disease severity however, it was significantly at par with trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 300 g/ha which recorded 12.86 PDI.

During 2015, anthracnose leaf spot severity 3, 7 and 10 Days after first and second sprays ranged from 9.61 to 39.70 per cent (table 2). During 2015 also, pooled analysis of anthracnose leaf spot severity 3, 7 and 10 Days after first and second sprays indicated that all the treatments significantly reduced the disease severity as compared to control. Among the different treatments, trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha which recorded 11.05 PDI, was found best in reducing the disease severity. The treatment was significantly at par with the 300 g/ha dose of the same fungicide which recorded 12.86 PDI.

Pooled analysis of two years data (2014 and 2015) also showed similar results. The disease severity 3, 7 and 10 Days after first and second sprays ranged from 10.08 to 40.30 per cent (table 3). Although, all the treatments were effective in managing the anthracnose leaf spot however, trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha was found to be the best wherein minimum 13.63 PDI was

Table 1a: Details of the fungicides used against anthracnose leaf spot and pod blight of soybean

S.No.	Treatment	Chemical Name	Trade name	Formulation	Dosage g. a.i./ ha	Form (g/ha)	Source
1	Untreated Check	-	-	-	-	-	
2	Trifloxystrobin 25% + Tebuconazole 50% WG	Methyl (2E)-2-methoxyimino-2-[2-[[(E)-1-[3-(trifluoromethyl)	Nativo 75 WG	75%WG	62.5+125	250	Bayer Crop Science Ltd.
3	Trifloxystrobin 25% + Tebuconazole 50%WG	phenyl]ethylideneamino]			75+150	300	Mumbai
4	Trifloxystrobin 25% + Tebuconazole 50%WG	oxymethyl]phenyl]acetate + 1-(4-chlorophenyl)-4,4-dimethyl-3-(1,2,4-triazol-1-ylmethyl) pentan-3-ol			87.5+175	350	
5	Trifloxystrobin 50WG	Methyl (2E)-2-methoxyimino-2-[2-[[(E)-1-[3-(trifluoromethyl) phenyl]ethylideneamino] oxymethyl]phenyl]acetate	Flint	50% WG	87.5	175	
6	Tebuconazole 25EC	1-(4-chlorophenyl)-4,4-dimethyl-3-(1,2,4-triazol-1-ylmethyl) pentan-3-ol	Tebuconazole 25% EC	25% EC	175	700	Tagros Chemicals India Ltd.
7	Triadimefon 25%WP	1-(4-chlorophenoxy)-3,3-dimethyl-1-(1,2,4-triazol-1-yl) butan-2-one	Bayleton WP 25	25% WP	125	500	Bayer Crop Science Ltd. Mumbai
8	Hexaconazole 5%EC	2-(2,4-dichlorophenyl)-1-(1,2,4-triazol-1-yl) hexan-2-ol	Contaf	5% EC	25	500	Rallis India Limited, Mumbai

Table 1b: Effect of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) against anthracnose leaf spot of soybean (2014)

Treatments	Dosage g a.i./ha	Form. (g/ha)	Per cent disease index PT	3DAIA	7DAIA	10DAIA	3DAIIA	7DAIIA	10DAIIA mean	Pooled
Untreated control	-	-	11.11	17.22	22.45	27.44	31.33	36.00	40.89	29.22
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	62.5+125	250	10.67	12.67	14.67	15.89	16.00	16.78	19.22	15.87
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	75.0+150	300	10.67	11.11	11.70	11.67	12.89	14.33	15.44	12.86
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	87.5+175	350	11.56	10.55	11.56	11.33	12.67	13.78	14.33	12.37
Trifloxystrobin 50 WG	87.5	175	11.78	14.00	20.00	22.78	24.22	26.67	32.44	23.35
Tebuconazole 25 EC	175	700	11.33	12.89	15.56	17.55	20.44	23.33	27.56	19.56
Bayleton (Triadimefon) 25% WP	125	500	10.89	13.33	17.33	19.89	21.56	24.67	29.11	20.98
Contaf (Hexaconazole) 5% EC	25	500	10.67	14.33	17.56	21.89	25.33	28.00	30.00	22.85
CD at 5%			2.03	1.12	1.28	1.47	1.42	1.41	1.54	1.72

PT = Pretreatment, DAIA = Days after first application, DAIIA = Days after second application

Table 2: Effect of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) against anthracnose leaf spot of soybean (2015)

Treatments	Dosage g a.i./ha	Form. (g/ha)	Per cent disease index PT	3DAIA	7DAIA	10DAIA	3DAIIA	7DAIIA	10DAIIA mean	Pooled
Untreated control	-	-	10.17	15.72	20.95	25.94	29.83	34.16	39.70	27.72
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	62.5+125	250	9.39	11.17	13.69	15.05	16.04	17.24	18.38	15.26
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	75+150	300	9.43	9.89	10.20	10.98	12.20	12.83	13.61	11.62
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	87.5+175	350	9.52	9.61	9.92	10.41	11.17	12.28	12.93	11.05
Trifloxystrobin 50 WG	87.5	175	10.22	12.84	18.17	20.95	22.72	25.17	30.94	21.80
Tebuconazole 25 EC	175	700	9.05	11.86	14.53	15.72	18.61	21.50	25.73	17.99
Bayleton (Triadimefon) 25% WP	125	500	10.43	11.83	15.83	19.72	20.39	23.50	27.61	19.81
Contaf (Hexaconazole) 5% EC	25	500	9.55	12.84	16.06	19.94	23.83	26.50	28.70	21.32
CD at 5%			3.00	1.00	1.14	0.91	1.16	1.41	1.06	1.70

PT = Pretreatment, DAIA = Days after first application, DAIIA = Days after second application

recorded. Nevertheless, it was significantly at par with the 300 g/ha dose of the same fungicide which recorded 14.53 PDI at final observation.

Effect of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) against anthracnose pod blight of soybean

The data presented in Table 4 revealed that during 2014, the incidence of pod blight 3, 7 and 10 Days after first and second sprays ranged from 5.72 to 26.41 per cent whereas, during 2015, it ranged from 6.37 to 28.68 per cent. Pooled analysis of data over two crop seasons indicated that all the treatments provided the disease management as compared to untreated control however, trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha which recorded 6.04 per cent pod blight incidence and 78.06 per cent disease control over control over check, was found to be the best in reducing the disease severity. Nevertheless, it was significantly at par with trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 300 g/ha wherein, 6.93 per cent disease incidence and 74.86 per cent disease control over check were recorded.

Based on the results of two crop seasons (table 1, 2, & 3) it can be concluded that among the different treatments, two spraying of trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha, first just after the appearance of the disease and second it's 14 days later was found to be the best in managing the disease however, it was significantly at par with trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 300 g/ha. Therefore, considering the economics, two sprays of trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 300 g/ha may be recommended for the management of anthracnose leaf spot and pod blight of soybean.

Effect of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) on yield of soybean

Yield data presented in Table 5 revealed that during the year 2014 yield varied from 640.74 to 1044.44 kg/ha. Most of the treatments except Contaf (Hexaconazole) 5% EC @ 500g/ha and Trifloxystrobin 50 WG @ 175g/ha, provided significantly higher yield over control. Highest yield (1044.44 kg/ha) was recorded by trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha however, it was significantly at par with the other two doses (@ 250 and 300g/ha) of the same fungicide.

During 2015, the yield varied from 660.00 to 1129.63 kg/ha. Similar trend was recorded during 2015 also. All the treatments provided significantly higher yield as compared to control. Highest yield (1129.63 kg/ha) was recorded by trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha however, it was significantly at par with the other two doses (@250 and 300g/ha) of same fungicide whereby 937.04 and 1040.74 kg/ha yields, respectively, were recorded.

Pooled yield of both the years ranged from 650.37 to 1059.26 kg/ha. Highest yield of 1059.26 kg/ha was recorded in trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha however, it was significantly at par with the other two doses (@250 and 300g/ha) of same fungicide whereby 937.04 and 1040.74 kg/ha yields respectively, were recorded.

Percent increase in yield over control calculated on the basis of pooled mean of two crop seasons ranged from 9.17 to 62.87. It was highest in trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 g/ha (62.87%) followed by trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 300 g/ha (60.31%), trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 250 g/ha (43.22%), Bayleton (Triadimefon) 25% WP @ 500g/ha (35.08%), Trifloxystrobin 50 WG @ 175g/ha (20.73%) and Tebuconazole 25 EC @ 700ml/ha (11.05%). Least increase in yield was observed in Contaf (Hexaconazole) 5% EC @ 500 ml/ha (9.17%) over control (Table 4).

Evaluation of Phytotoxicity of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) on soybean

Trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) was evaluated at 3 doses i.e. 350, 700 and 1400 g./ha at 1, 3, 7 and 10 days after application for phytotoxicity symptoms. The plants were observed for symptoms of phytotoxicity viz., chlorosis, necrosis, wilting, scorching, hyponasty and epinasty. No phytotoxic effect was noticed even at the highest tested dose of 1400 g/ha of trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) during both the cropping seasons (Table 6).

The present experiments with trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) on Soybean crop for two consecutive years clearly showed lowest Per cent Disease Index (PDI) and higher yield from the plot sprayed with trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 and 300 g/ha comparing to control. No phytotoxic symptoms were observed on the plants due to any trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) treatments. As trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 350 and 300 g/ha were significantly at par both in terms of disease management and realizing the yield, keeping in view the economics, trifloxystrobin 25% + tebuconazole 50% WG (Nativo 75 WG) @ 300 g/ha can be recommended for the management of anthracnose leaf spot/ pod blight and obtaining the higher yield.

Present findings are in accordance with the work of Nagaraj (2013) and Ingle *et al.*, (2014) who reported that trifloxystrobin + tebuconazole at 0.1 per cent was found very effective for the management of *Colletotrichum* leaf Spot of soybean. Similarly, field evaluation of fungicides indicated that seed treatment with carboxin + thiram (2 g/kg) or captan (2 g/kg) + foliar spray of trifloxystrobin + tebuconazole @ 0.1% at 55 DAS was found very effective in reducing the soybean anthracnose and enhancing the seed yield. Similar results were also obtained by Kinjal and Gohel (2016) in case of mungbean anthracnose who reported that the disease can be effectively managed by seed treatment with thiram 75 SD @ 3g/kg seed + two foliar sprays of trifloxystrobin + tebuconazole (75 WG) @ 0.075% at 15 days interval. Ann *et al.* (2017) also recorded efficacy of Nativo at 0.2 g/l and 0.4 g/l a.i. against anthracnose disease of pepper vines caused by *Colletotrichum gloeosporiode*s. Pepper vines treated with Nativo produced more quality berries and showed no phytotoxicity. Likewise, Anand *et al*. (2013) and Veerabhadraswamy *et al.*, (2014) found trifloxystrobin 25% + tebuconazole 50% (Nativo 75WG) to be the best against *Exserohilum turcicum* causing leaf blight disease, provided significant increase in yield with no phytotoxic effect of the fungicide on maize.

Two sprays of tebuconazole (0.1%) at 25 days interval has

Table 3: Effect of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) against anthracnose leaf spot of soybean (pooled data of 2014 and 2015)

Treatments	Dosage		Per cent disease Index						
			First spray				Second spray		
	g a.i./ ha	Form. (g/ha)	PT	3DAIA	7DAIA	10DAIA	3DAIIA	7DAIIA	10DAIIA
Untreated control	-	-	10.64	16.47	21.70	26.69	30.58	35.08	40.30
Trifloxystrobin 25 + Tebuconazole 50-75 WG	62.5+125	250	10.03	11.92	14.18	15.47	16.02	17.01	18.80
Trifloxystrobin 25 + Tebuconazole 50-75 WG	75+150	300	10.05	10.50	10.95	11.33	12.55	13.58	14.53
Trifloxystrobin 25 + Tebuconazole 50-75 WG	87.5+175	350	10.54	10.08	10.74	10.87	11.92	13.03	13.63
Trifloxystrobin 50 WG	87.5	175	11.00	13.42	19.09	21.86	23.47	25.92	31.69
Tebuconazole 25 EC	175	700	10.31	12.37	15.04	16.64	19.53	22.42	26.64
Bayleton (Triadimefon) 25% WP	125	500	10.66	12.58	16.58	19.81	20.97	24.08	28.36
Contaf (Hexaconazole) 5% EC	25	500	10.11	13.59	16.81	20.92	24.58	27.25	29.35
CD at 5%			1.89	0.67	0.86	0.87	1.07	0.89	1.02

PT = Pretreatment, DAIA = Days after first application, DAIIA = Days after second application

Table 4: Effect of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) against anthracnose pod blight of soybean (2014 & 2015)

Treatments	Dosage		Incidence of Pod Blight (%)			
	g a.i./ ha	Form. (g/ha)	2014	2015	Pooled mean	Disease control (%)
Untreated control	-	-	26.41	28.68	27.55	-
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	62.5+125	250	13.20	15.29	14.25	48.28
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	75+150	300	6.95	6.89	6.93	74.86
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	87.5+175	350	5.72	6.37	6.05	78.06
Trifloxystrobin 50 WG	87.5	175	15.23	17.67	16.45	40.29
Tebuconazole 25 EC	175	700	14.13	16.27	15.20	44.83
Bayleton (Triadimefon) 25% WP	125	500	14.49	17.09	15.79	42.69
Contaf (Hexaconazole) 5% EC	25	500	17.48	19.17	18.33	33.48
CD at 5%			1.51	1.10	0.88	-

Table 5: Effect of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) on yield of soybean (2015)

Treatments	Dosage	Yield (Kg/ha)				Increase in yield (%)
	g a.i./ ha	Form. (g/ha)	2014	2015	Pooled mean	
Untreated Control	-	-	640.74	660.00	650.37	-
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	62.5+125	250	925.93	937.04	931.49	43.22
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	75.0+150	300	988.89	1040.74	1042.60	60.31
Trifloxystrobin 25 + Tebuconazole 50- 75 WG	87.5+175	350	1044.44	1129.63	1059.26	62.87
Trifloxystrobin 50 WG	87.5	175	762.96	807.41	785.19	20.73
Tebuconazole 25 EC	175	700	714.81	729.63	722.22	11.05
Bayleton (Triadimefon) 25% WP	125	500	874.07	882.96	878.52	35.08
Contaf (Hexaconazole) 5% EC	25	500	700.74	719.26	710.00	9.17
CD at 5%			232.38	118.80	147.27	-

Table 6: Evaluation of phytotoxicity of Trifloxystrobin 25% + Tebuconazole 50% WG (Nativo 75 WG) in soybean (2014 and 2015)

Treatment	Days of observation after spray	Phytotoxicity symptoms					
		Chlorosis	Necrosis	Wilting	Scorching	Hyponasty	Epinasty
Untreated control (water spray)	1st day	0	0	0	0	0	0
	3rd day	0	0	0	0	0	0
	7th day	0	0	0	0	0	0
	10th day	0	0	0	0	0	0
Trifloxystrobin 25% + Tebuconazole 50%	1st day	0	0	0	0	0	0
WG (Nativo 75 WG) @ 350 gm/ha	3rd day	0	0	0	0	0	0
	7th day	0	0	0	0	0	0
	10th day	0	0	0	0	0	0
Trifloxystrobin 25% + Tebuconazole 50%	1st day	0	0	0	0	0	0
WG (Nativo 75 WG) @ 700 gm/ha	3rd day	0	0	0	0	0	0
	7th day	0	0	0	0	0	0
	10th day	0	0	0	0	0	0
Trifloxystrobin 25% + Tebuconazole 50%	1st day	0	0	0	0	0	0
WG (Nativo 75 WG) @ 1400 gm/ha	3rd day	0	0	0	0	0	0
	7th day	0	0	0	0	0	0
	10th day	0	0	0	0	0	0

been advocated for management of *Colletotrichum* Leaf Spot of soybean (Ingle *et al.*, 2014).

Inhibitory effect of hexaconazole against *C. truncatum, C. gleosporioides. C. capsici and C. lindemuthianum* was reported earlier by several workers (Swamy and Kulkarni, 2003; Kumar *et al.*, 2003; and Gorawar *et al.*, 2005 & 2006, Jagtap *et al.*, 2013) however, triadimefon has been recommended for the management of soybean rust (Surin, 1983).

Trifloxystrobin is a new strobilurin fungicide, active as a foliar spray against a wide range of fungal plant pathogens belonging to the Ascomycetes, Basidiomycetes, Fungi imperfecti and Oomycetes both under greenhouse and field conditions (Margot *et al.*, 1998; Tally *et al.*, 1998). The mechanism by which the strobilurin compounds act against the fungi is relatively well understood: they have been shown to inhibit mitochondrial respiration by blocking electron transfer in cytochromes b and c (Ypema and Gold, 1999). The new mode of action of strobilurins may prevent or delay the development of fungicide resistant pathogens, because there is no cross resistance with other fungicides currently on the market (Ypema and Gold, 1999). Alternating trifloxystrobin with other fungicides in spray programs or using it mixtures with them may reduce the development of fungicide-resistant populations; it may also enhance the performance of the compound and ensure greater timing flexibility (Margot *et al.*, 1998).

Tebuconazole a triazoles group fungicides, the mode of action of which is sterol biosynthesis inhibitor (SBI). Triazoles are in a subset of demethylation inhibitors. These fungicides inhibit cellular membrane formation. Common active ingredients in foliar fungicides labeled for use on soybean include propiconazole, prothioconazole, tebuconazole, and tetraconazole (Brent and Hollomon, 2007b, FRAC 2011).

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