



E-ISSN: 2278-4136

P-ISSN: 2349-8234

JPP 2019; 8(4): 1413-1421

Received: 28-05-2019

Accepted: 29-06-2019

**Shyam Singh**

Department of Plant Pathology,  
Sant Kabir College of Agriculture  
and Research Station (IGKV),  
Kawardha, District-Kabir  
Dham, Chhattisgarh, India

**Anjeet Jangre**

Department of Agronomy, Sant  
Kabir College of Agriculture and  
Research Station (IGKV),  
Kawardha, District-Kabir  
Dham, Chhattisgarh, India

## Efficacy of Evergol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) as seed treatment against leaf blast and brown leaf spot disease in rice

Shyam Singh and Anjeet Jangre

### Abstract

EverGol Xtend is a seed treatment formulation of two fungicide containing Penflufen 154 and Trifloxystrobin 154. It is a protectant fungicide formulation which protects the seed and seedling from infection of certain fungi. Therefore, an experimental was conducted to protect the rice crop by seeds treatment with Evergol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) from attack of *Pyricularia oryzae* and *Helminthosporium oryzae* in nursery and main field. Results indicated that the maximum germination was recorded in the plot treated with EverGol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) @ 28g/kg seed as wet seed treatment at 5 and 10 days after sowing during both the year and highest shoot length (32.01cm) and root length (12.84cm) was also recorded at 20 days after sowing in same treatment. Maximum no. of tillers per hill and no. of tillers per m<sup>2</sup> at 40 days after transplanting was recorded in the plot treated with Ever Gol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) @ 28g/ kg seed as wet seed treatment. EverGol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) was found effective against the leaf blast disease applied as seed treatment before and after soaking of seeds. Minimum leaf blast and brown leaf spot intensity was recorded in the plot treated with EverGol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) @ 28g/seed after soaking of seed. Maximum grain yield of 48.34, 41.66 and 45.00 quintal per hectare was recorded in plot treated with EverGol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) @ 28g/seed after soaking of seed during 2016-17 and 2017-18, respectively. Evergol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) was found most effective against leaf blast and brown spot as wet and dry seed treatment as compare to Penflufen 240 FS, Trifloxystrobin 500 SC and Thiram 75% WS.

**Keywords:** Ever Gol Xtend, leaf blast, brown leaf spot, fungicidal management, penflufen, trifloxystrobin

### Introduction

Rice (*Oryza sativa* L.) is one of the most important cereals of the world and is consumed by 50% of the world population (Ma *et al.*, 2007) [8]. In India, productivity of rice is very low as compared to other developed countries of the world and this low production is attributed to several biotic and abiotic factors (Reddy *et al.*, 2017) [10]. Among the biotic factors disease is the most important factor which results in heavy crop losses every year. Leaf Blast (*Pyricularia oryzae*) and Brown leaf spot (*Helminthosporium oryzae*) are the most destructive and wide spread diseases. Now days more effective fungicides are not available to protect the rice plants from the infection by fungi during seedling stage in nursery as well as in main field after transplanting through application of fungicides as seed treatment. The primary control of rice diseases in the nursery and starting stage of plant in main field by fungicide seed treatments are play an important role to minimize the crop losses. Therefore, keeping in view the above fact newer mixture formulation of fungicides was tested to find out the efficacy of Evergol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) against leaf blast and brown leaf spot disease in Rice as Seed Treatment. This formulation was developed by Bayer Crop Science Limited in emulsion formulation which containing the fungicides Penflufen 154 + Trifloxystrobin 154 FS. EverGol Xtend formulation is a seed dressing fungicides. It is a features newer fungicides combination having unique mode of action against fungal pathogen which supports resistance management in plant against several fungi. In this mixture have Penflufen molecule which is an innovative new generation Succinate Dehydrogenase Inhibitor (SDHI) used as seed treatment to protect crops from fungal infection. Besides these it is highly active against complex root disease caused by fungi. Another molecule of the formulation is Trifloxystrobin which have broad spectrum fungicidal properties. Trifloxystrobin is a synthetic derivative of the naturally occurring strobilurins found in several genera of wood decaying fungi.

### Correspondence

**Shyam Singh**

Department of Plant Pathology,  
Sant Kabir College of Agriculture  
and Research Station (IGKV),  
Kawardha, District-Kabir,  
Dham, Chhattisgarh, India

The mode of action of trifloxystrobin involves inhibition of mitochondrial respiration by blocking electron transfer in the electron transfer chain. Trifloxystrobin is a potent inhibitor of fungal spore germination and mycelial growth. This mixture has high anti-sporulant and fungistatic activity against several fungi causing disease in plants. EverGol Xtend provides seed and seedling protection against certain seed and soil-borne disease in several crops. It's also having root growth promoting activity which promote early emergence, improves early vigor, faster growth, creating stronger plants, larger stem diameter and more biomass. EverGol Xtend is a water soluble formulation and can be easily diluted with water or another suitable liquid just prior to application.

## Materials and methods

### Experiment Details

An experiment was conducted in well drained fertile and good quality soil classified as Vertisols at Research Farm, S.K. College of Agriculture and Research Station (Indira Gandhi Krishi Vishwavidyalaya), Kawardha (District- Kabierdham), Kawardha, Kabirdham (C.G.) Chhattisgarh, India during *Kharif* 2016–17 and 2017–18. All the normal Agronomical practices were followed to raise the Rice crop for undertaking “efficacy evaluation of Evergol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) in rice as seed treatment” against Leaf Blast (*Pyricularia oryzae*), Brown leaf spot (*Helminthosporium oryzae*). Experiments were layout under Randomized Block Design (RBD) with 15 treatments and four replications. Details of fungicides and their doses have been given in Table 1.

**Table 1:** Details of fungicides and their doses

Treatments details			
Code	Fungicides	Dose of fungicides (g/ml Kg <sup>-1</sup> )	
		Active ingredient	Formulation
T <sub>1</sub>	Untreated control	-	-
T <sub>2</sub>	EverGold Xtend (Penflufen 154+Trifloxystrobin 154 FS)	1.54+1.54	10
T <sub>3</sub>	EverGold Xtend (Penflufen 154+Trifloxystrobin 154 FS)	1.84+1.84	12
T <sub>4</sub>	EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	2.15+2.15	14
T <sub>5</sub>	Penflufen 240 FS	2.16	9
T <sub>6</sub>	Trifloxystrobin 500 SC	2.25	4.5
T <sub>7</sub>	Thiram 75% WS	2.25	3
T <sub>8</sub>	EverGold Xtend (Penflufen 154+Trifloxystrobin 154 FS)	4.31+4.31	28
T <sub>9</sub>	EverGold Xtend (Penflufen 154+Trifloxystrobin 154 FS)	1.54+1.54	10
T <sub>10</sub>	EverGold Xtend (Penflufen 154+Trifloxystrobin 154 FS)	1.84+1.84	12
T <sub>11</sub>	EverGold Xtend (Penflufen 154+Trifloxystrobin 154 FS)	2.15+2.15	14
T <sub>12</sub>	Penflufen 240 FS	2.16	9
T <sub>13</sub>	Trifloxystrobin 500 SC	2.25	4.5
T <sub>14</sub>	Thiram 75% WS	2.25	3
T <sub>15</sub>	EverGold Xtend (Penflufen 154+Trifloxystrobin 154 FS)	4.31+4.31	28

### Nursery experiment

Layout of nursery experiment was made by making of 15 plots with net plot size of 2.0M x 1.5M. Prior to pouring, container was shaken and then quantity of EverGol Xtend was taken as per treatments details. Fungicides slurry of 16ml was prepared for dry seed treatments whereas, 32 ml slurry of the fungicides was prepared made for wet seed treatments. Seed of variety Swaran was taken for conduct of experiments. In wet seed treatment, seeds of treatment T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>7</sub> and T<sub>8</sub> were soaked in water for overnight and water was drained out. The water soaked seeds are stored in shade for pre-germination. Germinated seeds showed pigeon breast stage were treated the seeds in polythene bag thoroughly with standard total slurry volume 32ml/kg seed (chemical + water) and allowed to dry under shade before sowing. After dry, seeds were sown in the raised nursery bed by making the line in 10 cm row to row distance. In case of dry seed treatment, seeds of treatment T<sub>1</sub>, T<sub>9</sub>, T<sub>10</sub>, T<sub>11</sub>, T<sub>12</sub>, T<sub>13</sub>, T<sub>14</sub> and T<sub>15</sub> were directly treated in polythene bag thoroughly with standard total slurry volume 32 ml/kg seed (chemical + water) and allowed to dry under shade. Treated seeds were used for sowing in nursery. After dry, seeds were sown in the raised nursery bed by making the line in 10 cm row to row distance.

### Main experiment

In the main field, 15 plots of 5.0M x 5.0M size were prepared for transplanting of seedlings. Individual plots were separated by bunds and irrigation channels to prevent the movement of water from one plot to another plot. Twenty one days old

seedlings were transplanted in the main field with spacing of 20 X 10 cm in all treatments. Recommended dose of fertilizers (120 Kg N, 80 Kg P, 60 Kg K per hectare) were applied in the experiment field. Necessary efforts were made to occurrence of diseases by delaying in sowing and planting time.

### Observations Recorded

Regular observations were recorded from the each replication of each treatment using standard procedure. The following observations were recorded:

### Germination

In nursery, 200 seeds of each treatment were sowed in line and total germinated seeds were counted at 5 and 10 days after sowing (DAS). Germination percentage was calculated by the following formula:-

$$\text{Seed Germination (\%)} = \frac{\text{Total number of germinated seed}}{\text{Total number of Seed Sown}} \times 100$$

### Phyto-toxicity

Phyto-toxicity effect on seedling at 5, 7, 10 and 20 days after sowing were recorded from the each replication of each treatment. Yellowing, stunting, necrosis, epinasty and hyponasty type of effect on seedlings were recorded in nursery at 5, 7, 10 and 20 days after sowing. Phytotoxicity were measured using 0-10 scale viz., 0=0% Crop response/ Crop injury, 1= 1-10% Crop response/ Crop injury, 2= 11-

20% Crop response/ Crop injury, 3= 21-30% Crop response/ Crop injury, 4= 31-40% Crop response/ Crop injury, 5=41-50% Crop response/ Crop injury, 6=51-60% Crop response/ Crop injury, 7=61-70% Crop response/ Crop injury, 8=71-80% Crop response/ Crop injury Crop, 9=81-90% response/ Crop injury, 10=91-100% Crop response/ Crop injury.

#### Number of plant stand

Total number of plants were counted in each replication of each treatment per 0.25 m<sup>2</sup> from three spots of each replication and treatment at 10 and 20 days after sowing (DAS) in the nursery. In case of main field, total number of tillers was counted in each replication of each treatment per 10 randomly selected hills at 40 days after transplanting (DAT). Number of tillers per square meter was also counted at 40 days after transplanting from randomly by selecting three places in each replication of each treatment.

#### Seedling health and vigour

Ten seedlings from each replication of each treatment were randomly selected at the time of transplanting. Shoot length and root length of seedling were measured and mean was calculated.

#### Disease severity

Observation on severity of leaf blast and brown spot were recorded at 10, 20 and 30 days after sowing in nursery and 10, 20, 30 and 40 days after transplanting in main field using the disease rating. Leaf blast severity was measured using 0-9 grade disease rating scale (0= No typical susceptible lesion observed with 0% diseases leaf area covered, 1= Rapid observation does not reveal leaf lesions, but careful scrutiny of each row reveals few lesions with <0.3% diseases leaf area covered, 2= Rapid detection detects a few lesions with 0.3-0.9% diseases leaf area covered, 3= Several lesions are randomly scattered within a plot, and the lesion number on an infected leaf ranges from 1 to 4 with 1-2% diseases leaf area covered, 4= Upper leaves are uniformly dotted with blast lesions but without necrotic (brown) leaf tips and few to several leaves are brown with 3-7% diseases leaf area covered, 5= Several or many lower leaves become necrotic and few dead leaves are observed. Tips of several upper leaves show brown color and begin to fold with 8-14% diseases leaf area covered, 6= Lower leaves are uniformly exhibiting brown color and several dead leaves are visible. Tip necrosis of upper leaves is predominant, 15-24% diseases leaf area covered, 7= Tips of most upper leaves are curling. Middle and lower leaves are brown. Several plants or tillers are stunted or dead, 25-39% diseases leaf area covered, 8= Extensive leaf curling and browning of upper and middle leaves are prevalent. Plants re generally stunted and many plants are dead, 45-65% diseases leaf area covered, 9= Majority of plants are severely stunted, brown and dead. Only few to several plants have green leaves with heavy infection, >65% diseases leaf area covered developed by Standard Evaluation System (IRRI, 2014) [6]. Brown spot severity was measured using 0-9 rating scale described as 0= Plants not showing any symptom, 1= Lesion limited to 1/4th of leaf sheath with 1-10% diseased leaf area, 1= Lesion limited to

1/4th of leaf sheath with 1-10% diseased leaf area, 1= Lesion limited to 1/4th of leaf sheath with 1-10% diseased leaf area, 2= plants showing lower half of leaf sheath with 11-20% diseased leaf area, 3= Lesion limited to 1/2th of leaf sheath with 21-30% diseased leaf area, 4= Lesion increase slight to 1/2th of leaf sheath with 31-40% diseased leaf area, 5= Lesion limited to more than 1/2th of leaf sheath with 41-50% diseased leaf area, 6= Slight infection on lower 3rd leaf with 51-60% diseased leaf area, 7= Lesion limited to 3/4th of leaf sheath 61-70% diseased leaf area, 8= Slight infection on flag leaf with 71-80% diseased leaf area, 9= Lesion on tiller and severe infection on all the leaf with 81-100% diseased leaf area developed by Standard Evaluation System (IRRI, 2014)[6].

Percentage disease intensity of all three diseases was calculated using the following formula:

$$\text{Disease intensity (\%)} = \frac{\text{Sum of all numerical ratings}}{\text{No. of plants observed} \times \text{maximum rating}} \times 100$$

#### Number of tillers in main field

No. of tillers per hill were counted from randomly selected 10 plants in each replication of each treatment at 40 days after transplanting in main field. Number of tiller per m<sup>2</sup> was also counted from randomly selected three places in each replication of each treatment at 40 days after transplanting. Number of effective tillers per m<sup>2</sup> was also counted from randomly selected three places in each replication of each treatment at maturity time.

#### Grain yield per plot and per ha

Grain yield per plot and per ha were recorded in each replication of each treatment and mean of the replication was calculated.

#### Statistical analysis

All the data were analyzed for significance of variance through RBD analysis after conversion of percentage data transformation value using Arcsine Transformation. No transformations was applied in number of plant per 0.25m<sup>2</sup> in nursery, number of tiller per hill or per m<sup>2</sup>, shoot length and root length of seedling and in yield data. Finally pooled mean was calculated for both the year and draw the conclusions.

## Results

#### Seed germination

Experimental data regarding seed germination, indicated that the maximum germination was recorded in treatment T<sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) 69.50, 87.00% and 70.00, 89% at 5 and 10 days after sowing followed by T<sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) which showed 69.00, 86.00% and 72.50, 87.00%, germination at 5 and 10 days after sowing during 2016-17 and 2017-18, respectively. In case of fungicides maximum germination was recorded EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS), Thiram 75%WS followed by Penflufen 240 FS and Trifloxystrobin 154 FS during both the year (Table 2).

**Table 2:** Effect of EverGold Xtend on seed germination of rice during *Kharif* season 2016-17 and 2017-18

Treatments	Dose (g or ml/kg seed)	Method of application	Germination (%)					
			2016-17		2017-18		Pooled	
			5 DAS	10 DAS	5 DAS	10 DAS	5 DAS	10 DAS
T <sub>1</sub> = Untreated control	-		56.00 (48.45)*	74.00 (59.34)	58.50 (49.89)	72.50 (58.37)	57.25 (49.17)	73.25 (58.86)
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	After soaking	58.00 (49.60)	78.00 (62.03)	61.50 (51.66)	78.50 (62.37)	59.75 (50.63)	77.75 (62.20)
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12		59.00 (50.19)	78.00 (62.03)	62.00 (51.94)	80.00 (63.44)	60.50 (51.07)	79.00 (79.00)
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14		60.50 (51.06)	80.00 (63.44)	64.00 (53.13)	82.00 (64.90)	62.25 (52.10)	81.00 (64.17)
T <sub>5</sub> = Penflufen 240 FS	9		62.00 (51.94)	82.00 (64.90)	65.00 (53.73)	83.00 (65.66)	63.50 (52.84)	82.50 (82.50)
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5		57.50 (49.31)	76.00 (60.67)	60.00 (50.77)	76.50 (61.00)	58.75 (50.04)	76.25 (60.84)
T <sub>7</sub> = Thiram 75% WS	3		56.50 (48.73)	75.00 (60.00)	59.00 (50.18)	74.00 (59.34)	57.75 (49.46)	74.50 (59.67)
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28		69.50 (56.48)	87.00 (68.87)	70.00 (56.79)	89.00 (70.63)	69.75 (56.64)	88.00 (69.75)
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10		56.50 (48.73)	75.00 (60.00)	58.50 (49.89)	73.50 (59.02)	57.50 (49.31)	74.25 (59.51)
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12		57.00 (49.02)	73.50 (59.02)	60.00 (50.77)	72.00 (58.06)	58.50 (49.90)	72.75 (58.54)
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14		57.50 (49.31)	75.00 (60)	60.50 (51.06)	75.00 (60.00)	59.00 (50.19)	75.00 (60.00)
T <sub>12</sub> = Penflufen 240 FS	9	Before soaking	58.50 (49.89)	76.50 (61.00)	64.00 (53.13)	77.50 (61.68)	61.25 (51.51)	77.00 (61.34)
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5		57.00 (49.02)	74.50 (59.67)	59.00 (50.18)	76.50 (61.00)	58.00 (49.60)	75.50 (60.34)
T <sub>14</sub> = Thiram 75% WS	3		57.50 (49.31)	74.00 (59.34)	60.00 (50.77)	76.00 (60.67)	58.75 (50.04)	75.00 (60.01)
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28		69.00 (56.17)	86.50 (68.44)	72.50 (58.37)	87.50 (69.30)	70.75 (57.27)	87.00 (68.87)
SEm±			1.15	1.23	1.20	1.30	1.18	1.27
CD at 5%			3.39	3.62	3.56	3.89	3.48	3.76

\*Figure () are Arc Sine Transformation Value

**Plant population in nursery**

Mean plant population in nursery at 10 and 20 days after sowing have been presented in table 3 reveal that the maximum plant population (330, 328 and 320, 318 per 0.25m<sup>2</sup>) was recorded in plot treated with T<sub>8</sub>=EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) @ 28ml/kg seed

after soaking of seeds at 10 and 20 days of sowing, respectively. In case of fungicides EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) showed significant higher plant population as compared to Trifloxystrobin 500 SC, Penflufen 240 FS @ and Thiram 75% WS.

**Table 3:** Effect of EverGold Xtend Xtend on plant population in nursery during *Kharif* season 2016-17 and 2017-18

Treatments	Formulation (ml or g/kg seed)	Method of application	Plant Stand in Nursery (per 0.25 m <sup>2</sup> )					
			2016-17		2017-18		Pooled	
			10 DAS	20 DAS	10 DAS	20 DAS	10 DAS	20 DAS
T <sub>1</sub> = Untreated control	-		305	300	300	307	302.50	303.50
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	After soaking	323	320	325	328	324.00	324.00
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12		324	322	330	330	327.00	326.00
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14		327	324	335	335	331.00	329.50
T <sub>5</sub> = Penflufen 240 FS	9		313	311	315	317	314.00	314.00
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5		304	300	297	309	300.50	304.50
T <sub>7</sub> = Thiram 75% WS	3		302	299	295	300	298.50	299.50
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	Before soaking	330	328	348	346	339.00	337.00
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10		311	308	308	315	309.50	311.50
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12		313	309	312	318	312.50	313.50
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14		318	315	317	322	317.50	318.50
T <sub>12</sub> = Penflufen 240 FS	9		308	304	303	310	305.50	307.00
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5		302	298	300	295	301.00	296.50
T <sub>14</sub> = Thiram 75% WS	3		307	302	303	312	305.00	307.00
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28		320	318	335	340	327.50	329.00
SEm±			6.26	6.86	7.45	7.00	6.86	7.93
CD at 5%		18.47	20.01	22.13	20.65	20.30	20.33	

**Seedling health and vigour**

Data pertaining to shoot length (cm) and root length (cm) have been presented in table 4 indicated that the highest shoot length (30.79, 33.23, 32.01cm) and root length (12.58, 13.09, 12.84cm) was recorded in treatment T<sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) at 20 days after sowing during 2016-17, 2017-18, mean of two year followed by T<sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin

154 FS) and minimum of shoot length (26.59, 28.53, 27.56cm, ) and root length (10.04, 10.29, 10.17cm) was recorded in treatment T<sub>1</sub> = Untreated control at 20 days after sowing during 2016-17, 2017-18, mean of two year. Fungicides EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) showed significantly superior seedling health and vigour as compared to Penflufen 240 FS, Trifloxystrobin 500 SC and Thiram 75% WS fungicides

**Table 4:** Effect of EverGold Xtend Xtend on seedling health and vigour during *Kharif* season 2016-17 and 2017-18

Treatments details			2016-17		2017-18		Pooled		
Fungicides	Dose of formulation (ml or g/kg seed)	Method of application	Shoot Length (cm)	Root Length (cm)	Shoot Length (cm)	Root Length (cm)	Shoot Length (cm)	Root Length (cm)	
T <sub>1</sub> = Untreated control	-	After soaking	26.59	10.04	28.53	10.29	27.56	10.17	
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10		26.72	11.68	28.68	12.10	27.70	11.89	
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12		27.14	11.72	29.15	12.14	28.15	11.93	
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14		30.01	12.09	32.36	12.55	31.19	12.32	
T <sub>5</sub> = Penflufen 240 FS	9		29.49	11.00	31.78	11.35	30.64	11.18	
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5		30.52	11.20	32.93	11.57	31.73	11.39	
T <sub>7</sub> = Thiram 75% WS	3		29.37	11.04	31.64	11.39	30.51	11.22	
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28		30.79	12.58	33.23	13.09	32.01	12.84	
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10		Before soaking	27.05	11.75	29.05	12.18	28.05	11.97
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12			28.24	12.38	30.38	12.87	29.31	12.63
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14			29.38	12.12	31.66	12.58	30.52	12.35
T <sub>12</sub> = Penflufen 240 FS	9			28.32	10.98	30.47	11.33	29.40	11.16
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5			28.47	10.95	30.64	11.30	29.56	11.13
T <sub>14</sub> = Thiram 75% WS	3			28.32	10.76	30.47	11.09	29.40	10.93
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28			29.54	12.30	31.83	12.78	30.69	12.54
SEm±		0.19		0.13	0.21	0.12	0.20	0.13	
CD at 5%		0.56	0.39	0.63	0.35	0.60	0.37		

**Phytotoxicity effect on seedlings**

The phytotoxicity symptoms in the form of yellowing, stunting, necrosis, epinasty hyponasty were not observed in treatment T<sub>7</sub> = Untreated Control, T<sub>4</sub> = EverGol Xtend (Penflufen 154 + Trifloxystrobin 154 FS), T<sub>8</sub> = EverGol Xtend (Penflufen 154 + Trifloxystrobin 154 FS), T<sub>11</sub> = EverGol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) and T<sub>15</sub> = EverGol Xtend (Penflufen 154 + Trifloxystrobin 154 FS) at 5, 7, 10 and 20 days after sowing in nursery.

**Plant population in main field**

Mean plant population of two year have been presented in Table 5 reveal that maximum number of tillers per hill and

number of tillers per m<sup>2</sup> was recorded at 40 days after transplanting. Maximum number of tillers per hill (8.80 and 9.35) and number of tillers per m<sup>2</sup> (413 and 439) was recorded in treatment T<sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) followed by T<sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS). EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) showed significantly higher number of tillers per hill and number of tillers per m<sup>2</sup> as compared to Penflufen 240 FS, Trifloxystrobin 500 SC and Thiram 75% WS fungicides. Minimum number of tillers per hill (6.87 and 7.75) and number of tillers per m<sup>2</sup> (323 and 364) was recorded in treatment T<sub>1</sub> = Untreated control.

**Table 5:** Effect of EverGold Xtend Xtend on plant population in main field during *Kharif* season 2016-17 and 2017-18

Treatments	Formulation (ml or g/kg seed)	Method of application	2016-17		2017-18		Pooled		
			No. of tillers per hill	No. of tillers (per m <sup>2</sup> )	No. of tillers per hill	No. of tillers (per m <sup>2</sup> )	No. of tillers per hill	No. of tillers (per m <sup>2</sup> )	
T <sub>1</sub> = Untreated control	-	After soaking	6.87	323	7.75	364	7.31	344	
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10		8.00	376	8.67	407	8.34	392	
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12		8.50	400	9.10	428	8.80	414	
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14		8.80	413	9.35	439	9.08	426	
T <sub>5</sub> = Penflufen 240 FS	9		7.93	373	8.60	404	8.27	389	
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5		7.53	354	8.30	390	7.92	372	
T <sub>7</sub> = Thiram 75% WS	3		7.15	336	7.94	373	7.55	355	
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28		9.15	430	9.65	454	9.40	442	
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10		Before soaking	7.78	366	8.47	398	8.13	382
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12			8.18	384	8.83	415	8.51	400
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14			8.35	392	9.00	423	8.68	408
T <sub>12</sub> = Penflufen 240 FS	9			7.48	351	8.25	388	7.87	370
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5			7.35	345	8.15	383	7.75	364
T <sub>14</sub> = Thiram 75% WS	3			7.08	333	7.80	366	7.44	350
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28			8.95	421	9.50	447	9.23	434
SEm±		0.25		5.67	0.23	5.89	0.24	5.78	
CD at 5%		0.73	16.80	0.68	17.40	0.72	17.10		

**Leaf Blast Intensity**

In nursery, no leaf blast intensity was recorded in treatment T<sub>8</sub>, T<sub>15</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>7</sub>, T<sub>8</sub>, T<sub>9</sub>, T<sub>10</sub>, T<sub>11</sub>, T<sub>14</sub>, and T<sub>15</sub> at 10 and 20 days after sowing while, maximum leaf blast intensity of 5.27% was recorded in control (untreated) plot at 20 days after sowing (Table 6). Main field data of leaf blast intensity have been presented in table 7 indicated that the EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) was found effective against leaf blast disease applied as seed treatment before and after soaking of seeds. Minimum disease leaf blast

intensity of 4.31, 8.28, 12.78, 15.72 and 2.50, 8.06, 11.81, 12.64% was recorded in treatment T<sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) at 10, 20, 30, 40 days after transplanting during 2016-17 and 2017-18, respectively followed by T<sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) and maximum leaf blast intensity of 12.08, 16.53, 19.72, 25.28 and 10.28, 14.86, 22.36, 23.19 in treatment T<sub>1</sub> = Untreated control at 10, 20, 30, 40 days after transplanting during 2016-17 and 2017-18, respectively.

**Table 6:** Effect of EverGold Xtend Xtend on Leaf Blast in nursery during *Kharif* season 2016-17 and 2017-18

Fungicides	Dose of formulation (ml or g/kg seed)	Leaf Blast intensity					
		2016-17		2017-18		Mean	
		10 DAS	20 DAS	10 DAS	20 DAS	10 DAS	20 DAS
T <sub>1</sub> = Untreated control	-	0.00	5.67 (13.75)*	0.00	4.86 (12.70)	0.00	5.27 (13.23)
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>5</sub> = Penflufen 240 FS	9	0.00	4.72 (12.60)	0.00	5.00 (12.92)	0.00	4.86 (12.76)
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5	0.00	3.75 (11.18)	0.00	4.72 (12.57)	0.00	4.24 (11.88)
T <sub>7</sub> = Thiram 75%WS	3	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>12</sub> = Penflufen 240 FS	9	0.00	4.31 (12.03)	0.00	4.50 (12.25)	0.00	4.41 (12.14)
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5	0.00	3.33 (10.55)	0.00	4.53 (12.30)	0.00	3.93 (11.43)
T <sub>14</sub> = Thiram 75%WS	3	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
SEM±		-	0.28	-	0.41	-	0.35
CD at 5%		-	0.83	-	1.23	-	1.03

\*Figure () are Arc Sine Transformation Value

**Table 7:** Effect of EverGold Xtend Xtend on Leaf Blast in main field during *Kharif* season 2016-17 and 2017-18

Fungicides	Dose of formulation (ml or g/kg seed)	Leaf Blast intensity							
		2016-17				2017-18			
		10 DAT	20 DAT	30 DAT	40 DAT	10 DAT	20 DAT	30 DAT	40 DAT
T <sub>1</sub> = Untreated control	-	12.08 (20.34)*	16.53 (23.99)	19.72 (26.34)	25.28 (30.15)	10.28 (18.69)	14.86 (22.58)	22.36 (28.11)	23.19 (27.59)
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	6.67 (15.46)	12.36 (20.58)	15.69 (23.29)	17.92 (24.98)	4.72 (12.50)	10.00 (18.25)	13.89 (21.62)	15.56 (22.81)
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	4.86 (12.79)	10.11 (18.54)	14.44 (22.28)	16.11 (23.58)	3.06 (9.98)	8.75 (16.98)	12.22 (20.13)	14.17 (21.61)
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	4.31 (13.33)	8.28 (16.72)	12.78 (20.89)	15.72 (23.27)	2.50 (8.97)	8.06 (16.23)	11.81 (19.75)	12.64 (20.20)
T <sub>5</sub> = Penflufen 240 FS	9	10.42 (13.60)	14.72 (22.56)	17.92 (25.01)	23.19 (28.75)	8.61 (17.05)	12.36 (20.46)	20.42 (26.73)	22.44 (28.06)
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5	8.89 (16.59)	13.47 (21.53)	18.61 (25.52)	21.11 (27.30)	7.08 (15.41)	11.67 (19.84)	17.36 (24.44)	20.61 (26.75)
T <sub>7</sub> = Thiram 75%WS	3	6.81 (16.63)	13.06 (21.18)	16.69 (24.07)	19.86 (26.41)	5.14 (13.06)	10.69 (18.92)	14.58 (22.20)	18.19 (24.93)
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	3.33 (14.14)	5.75 (13.87)	11.53 (19.78)	13.94 (21.82)	1.25 (5.97)	6.39 (14.25)	8.89 (16.75)	10.86 (18.39)
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	6.53 (14.65)	11.67 (19.97)	14.86 (22.63)	17.25 (24.47)	4.86 (12.69)	9.31 (17.56)	13.33 (21.13)	14.86 (22.21)
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	4.72 (14.89)	8.42 (16.86)	13.19 (21.24)	16.42 (23.83)	2.92 (9.74)	7.92 (16.08)	12.08 (20.00)	14.03 (21.48)
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	3.75 (16.01)	7.72 (16.13)	12.92 (21.01)	15.75 (23.30)	2.36 (8.70)	7.36 (15.44)	11.67 (19.61)	12.22 (19.79)
T <sub>12</sub> = Penflufen 240 FS	9	9.86 (16.05)	14.03 (22.00)	18.47 (25.42)	22.36 (28.18)	8.06 (16.47)	11.11 (19.32)	19.03 (24.71)	21.72 (27.55)
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5	8.33	13.47	17.25	20.42	6.53	11.11	16.94	20.92

		(13.48)	(21.53)	(24.50)	(26.81)	(14.78)	(19.32)	(24.12)	(26.98)
T <sub>14</sub> = Thiram 75% WS	3	6.94 (14.01)	13.06 (21.18)	16.00 (23.51)	19.31 (26.01)	5.00 (12.88)	10.69 (18.92)	14.03 (21.74)	18.75 (25.36)
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	3.47 (14.26)	6.03 (14.21)	12.50 (20.64)	14.50 (22.29)	1.67 (7.18)	6.67 (14.61)	9.31 (17.22)	11.11 (18.66)
SEm±		0.33	0.37	0.64	0.71	0.52	0.63	0.86	1.20
CD at 5%		0.98	1.10	1.89	2.12	1.53	1.88	2.54	3.55

\*Figure () are Arcsine Transformation Value

### Brown leaf spot disease intensity

Intensity of brown leaf spot disease was recorded at 10 and 20 days after sowing in nursery using standard procedure. Data presented in table 8 indicated that the no brown leaf spot intensity was recorded in treatment T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>8</sub>, T<sub>10</sub>, T<sub>11</sub> and T<sub>15</sub>. Whereas, brown leaf spot intensity was recorded in treatment T<sub>5</sub> = Penflufen 240 FS (13.61 and 10.45%), T<sub>6</sub> = Trifloxystrobin 500 SC (8.33 and 9.80%), T<sub>7</sub> = Thiram 75% WS (6.11 and 4.10%), Penflufen 240 FS (9.44 and 10.41%), T<sub>12</sub> = Trifloxystrobin 500 SC (6.67 and 6.80%) and T<sub>14</sub> = Thiram 75% WS (6.11 and 4.12%) at 20 days after sowing during 2016-17 and 2017-18, respectively. Fungicide EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) was found most effective in controlling brown leaf spot disease in rice as compare to Penflufen 240 FS, Trifloxystrobin 500 SC, Thiram 75% WS. Intensity of brown

leaf spot disease was recorded at 10 and 20 days after sowing in nursery using standard procedure. Data on brown leaf spot disease intensity in main field have been presented in table 10 indicated that the no disease intensity was recorded in treatment T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>8</sub>, T<sub>10</sub>, T<sub>11</sub> and T<sub>15</sub>. Fungicide EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) was found most effective in controlling brown leaf spot disease in rice as compare to Penflufen 240 FS, Trifloxystrobin 500 SC, Thiram 75% WS. Most effective treatment was found which exhibited 0.00, 3.28, 12.33, 32.50 and 0.00, 4.00, 18.46, 26.78 at 10, 20, 30 and 40 days after transplanting during 2016-17 and 2017-18, respectively (Table 9). However, maximum brown spot intensity of 18.83, 26.94, 38.50, 46.67 and 8.96, 12.40, 28.60 and 36.75 per cent was recorded at 10, 20, 30 and 40 days after transplanting during 2016-17 and 2017-18, respectively.

**Table 8:** Effect of EverGold Xtend Xtend on brown leaf spot disease in nursery during *Kharif* season 2016-17 and 2017-18

Fungicides	Dose of formulation (ml or g/kg seed)	Brown Leaf Spot Intensity					
		2016-17		2017-18		Mean	
		10 DAS	20 DAS	10 DAS	20 DAS	10 DAS	20 DAS
T <sub>1</sub> = Untreated control	-	0.00	15.83 (23.34)*	0.00	12.25 (20.32)	0.00	14.04 (21.83)
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>5</sub> = Penflufen 240 FS	9	0.00	13.61 (21.51)	0.00	10.45 (18.64)	0.00	12.03 (20.08)
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5	0.00	8.33 (16.45)	0.00	9.80 (18.00)	0.00	9.07 (17.23)
T <sub>7</sub> = Thiram 75% WS	3	0.00	6.11 (13.73)	0.00	4.10 (10.01)	0.00	5.11 (11.87)
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	0.00	4.56 (11.82)	0.00	4.00 (10.87)	0.00	4.28 (11.35)
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
T <sub>12</sub> = Penflufen 240 FS	9	0.00	9.44 (17.75)	0.00	10.41 (18.70)	0.00	9.93 (18.23)
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5	0.00	6.67 (14.71)	0.00	6.80 (14.87)	0.00	6.74 (14.79)
T <sub>14</sub> = Thiram 75% WS	3	0.00	6.11 (14.01)	0.00	4.12 (11.09)	0.00	5.12 (12.55)
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	0.00	0.00 (0.00)	0.00	0.00 (0.00)	0.00	0.00 (0.00)
SEm±			1.15		1.38		1.27
CD at 5%			3.41		4.12		3.77

\*Figure () are Arc Sine Transformation Value

**Table 9:** Effect of EverGold Xtend Xtend on brown leaf spot disease in main field during *Kharif* season 2016-17 and 2017-18

Fungicides	Dose of formulation (ml or g/kg seed)	Brown Leaf Spot Disease Intensity							
		2016-17				2017-18			
		10 DAT	20 DAT	30 DAT	40 DAT	10 DAT	20 DAT	30 DAT	40 DAT
T <sub>1</sub> = Untreated control	-	18.83 (25.64)*	26.94 (31.25)	38.50 (38.29)	46.67 (43.05)	8.96 (17.26)	12.40 (20.53)	28.60 (31.99)	36.75 (37.15)
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	0.00 (0.00)	10.56 (18.84)	23.89 (29.05)	38.06 (37.94)	6.45 (14.44)	10.14 (18.44)	25.10 (29.60)	34.45 (35.73)
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	0.00 (0.00)	8.28 (16.54)	18.28 (24.95)	34.44 (35.72)	0.00 (0.00)	8.24 (16.50)	22.06 (27.40)	30.00 (32.90)
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	0.00 (0.00)	4.44 (11.63)	15.89 (23.02)	33.06 (34.86)	0.00 (0.00)	5.28 (12.90)	21.20 (26.75)	28.22 (31.37)
T <sub>5</sub> = Penflufen 240 FS	9	15.61 (23.16)	24.72 (29.79)	33.72 (35.40)	43.89 (41.42)	10.25 (18.55)	17.65 (24.79)	29.92 (32.85)	36.89 (37.23)
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5	10.56 (18.75)	19.44 (26.12)	29.00 (32.44)	39.17 (38.61)	9.64 (17.95)	14.76 (22.52)	23.67 (28.59)	32.44 (34.47)

T <sub>7</sub> = Thiram 75% WS	3	8.11 (16.20)	17.22 (24.47)	26.22 (30.62)	36.39 (36.93)	15.42 (23.06)	18.48 (25.41)	29.76 (32.75)	39.11 (38.57)
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	0.00 (0.00)	3.28 (9.33)	12.33 (19.79)	32.50 (34.51)	0.00 (0.00)	4.00 (10.87)	18.46 (24.56)	26.78 (30.76)
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	5.11 (12.65)	15.72 (23.30)	25.17 (29.92)	38.33 (38.10)	0.00 (0.00)	10.04 (18.34)	27.11 (30.99)	41.33 (39.90)
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	0.00 (0.00)	9.22 (17.53)	21.67 (27.48)	35.83 (36.58)	0.00 (0.00)	8.80 (17.09)	22.69 (33.05)	30.22 (33.05)
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	0.00 (0.00)	7.72 (15.93)	16.17 (23.26)	33.33 (35.03)	0.00 (0.00)	6.17 (14.09)	21.41 (26.91)	29.15 (32.35)
T <sub>12</sub> = Penflufen 240 FS	9	13.44 (21.43)	20.56 (26.93)	30.11 (33.15)	40.28 (39.28)	11.46 (19.68)	14.96 (22.69)	24.86 (29.44)	32.44 (34.47)
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5	9.25 (17.56)	17.78 (24.89)	27.33 (31.36)	37.50 (37.60)	9.00 (17.30)	15.48 (23.11)	23.58 (28.52)	31.33 (33.76)
T <sub>14</sub> = Thiram 75% WS	3	7.00 (15.11)	17.02 (24.31)	25.94 (30.44)	36.11 (36.75)	17.31 (24.53)	20.04 (26.55)	29.72 (32.72)	36.67 (37.10)
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	0.00 (0.00)	4.17 (11.18)	12.06 (19.52)	31.22 (33.69)	0.00 (0.00)	4.04 (10.95)	17.11 (23.38)	26.67 (30.69)
SEM±		1.28	1.36	1.43	1.53	0.98	1.15	1.30	1.45
CD at 5%		3.81	4.01	4.25	4.51	2.90	3.43	3.84	4.31

\*Figure () are Arc Sine Transformation Value

**Table 10:** Effect of EverGol Xtend on grain yield of rice during *Kharif* season 2016-17 and 2017-18

Treatments details		Yield					
Fungicides	Dose of formulation (ml or g/kg seed)	2016-17		2017-18		Mean	
		Per plot (kg.)	Per ha. (Q.)	Per plot (kg.)	Per ha. (Q.)	Per plot (kg.)	Per ha. (Q.)
T <sub>1</sub> = Untreated control	-	10.004	40.02	8.361	33.44	9.183	36.73
T <sub>2</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	11.160	44.64	9.387	37.55	10.274	41.10
T <sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	11.281	45.12	9.666	38.66	10.474	41.89
T <sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	11.900	47.60	9.864	39.45	10.882	43.53
T <sub>5</sub> = Penflufen 240 FS	9	10.356	41.42	9.228	36.91	9.792	39.17
T <sub>6</sub> = Trifloxystrobin 500 SC	4.5	10.650	42.60	9.259	37.03	9.955	39.82
T <sub>7</sub> = Thiram 75% WS	3	11.031	44.12	8.466	33.86	9.749	38.99
T <sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	12.084	48.34	10.415	41.66	11.250	45.00
T <sub>9</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	10	10.916	43.66	9.310	37.24	10.113	40.45
T <sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	12	11.224	44.90	9.619	38.48	10.422	41.69
T <sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	14	11.306	45.22	9.628	38.51	10.467	41.87
T <sub>12</sub> = Penflufen 240 FS	9	10.409	41.64	9.232	36.93	9.821	39.29
T <sub>13</sub> = Trifloxystrobin 500 SC	4.5	11.018	44.07	9.275	37.10	10.147	40.59
T <sub>14</sub> = Thiram 75% WS	3	11.147	44.59	8.837	35.35	9.992	39.97
T <sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS)	28	12.003	48.01	10.076	40.30	11.040	44.16
SEM±		0.051	0.25	0.061	0.23	0.056	0.24
CD at 5%		0.152	0.74	0.180	0.69	0.166	0.72

### Effect of EverGol Xtend on grain yield

Grain yield of obtained in different treatment have been presented in Table 10 indicated that the maximum grain yield of 48.34, 41.66 and 45.00 quintal per hectare was recorded during 2016-17, 2017-18 and average in treatment T<sub>8</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) followed by T<sub>15</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS), T<sub>4</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS), T<sub>11</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS), T<sub>3</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) and T<sub>10</sub> = EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS). Minimum grain yield was recorded in untreated plot.

In this study, experimental data indicated that the significantly increase in seed germination was recorded in wet seed treated with EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) at 5 and 10 days after sowing followed by and dry seed treatment with EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) at 5 and 10 days after sowing as compare to Thiram 75% WS, Penflufen 240 FS and Trifloxystrobin 154 FS. Maximum plant population per 0.25 square meter, highest shoot length and root length, maximum No. of tillers per hill and No. of tillers per m<sup>2</sup> at 40 days after

transplanting was recorded in plot treated with EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) after soaking of seed and before soaking of seeds as compare to Penflufen 240 FS, Trifloxystrobin 500 SC and Thiram 75% WS. Intensity of leaf blast and brown leaf spot in nursery cent percent was checked with EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS). In the main field, EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) was found effective against the leaf blast and brown leaf spot disease applied as seed treatment before and after soaking of seeds. Significantly grain yield was increased with the application of EverGold Xtend (Penflufen 154 + Trifloxystrobin 154 FS) as wet and dry seed treatment over Penflufen 240 FS, Trifloxystrobin 500 SC and Thiram 75% WS. Urrea *et al.* (2013) [12] revealed that the broad-spectrum fungicides trifloxystrobin + metalaxyl and mefenoxam + fludioxonil + azoxystrobin resulted in the highest plant stands and found effective control the *Pythium* spp. and *Rhizoctonia solani* in soybean crops. Tebuconazole 50% + Trifloxystrobin 25% was showed 100 per cent inhibition of sclerotial germination in both wet and dry seed treatments (Sandhya *et al.*, 2018) [11]. Kumar *et al.* (2019) [7] reported that the seed treatment with Raxil 060FS, Trifloxystrobin 500SC, Tebuconazole 2% DS, Trifloxystrobin



+ Tebuconazole 080 FS, Nativo (Trifloxystrobin 25% + Tebuconazole 50%) 75 WG, Flint (Trifloxystrobin) 75 WG, Vitavax, Neemexcel and Bioagent (*T. harzianum*) significantly increased the germination percentage of wheat seed. Ahmed *et al.* (2002) <sup>[1]</sup> evaluated four fungicides viz. Bavistin, Hinosan, Tilt 250 EC and Dithane M-45 were against *Bipolaris oryzae*. Dithane M-45 was the best with 100% reduction of the prevalence of the pathogen and inhibited the mycelial growth at 0.3% of the seed weight as seed treatments and 500 ppm as mycelial growth inhibition test followed by Tilt 250 EC, Hinosan and Bavistin. All test fungicides were effective against *Bipolaris oryzae* at higher concentration. Propiconazol 0.1%, Carbendazim+Mancozeb 0.1%, Carboxin+Thiram 0.2% Tebuconazol 0.1% and copper oxychloride 0.3% completely inhibited the growth of *Fusarium fujikuroi*, *Curvularia lunata*, *Helminthosporium oryzae* (Waris *et al.*, 2018) <sup>[14]</sup>. Rajasekar and Jeyakumar (2014) <sup>[9]</sup> evaluated trifloxystrobin in combination with tebuconazole on the nutrient uptake, yield attributes and yield of rice. The result indicated that trifloxystrobin in combination with tebuconazole significantly improved the root length, total dry matter production (TDMP) and nutrient uptake, panicle length and grain yield in rice. Dutta *et al.* (2012) <sup>[4]</sup> evaluated efficacy of Nativo 75WG, Gain 75 WP, Score 250 EC, Hexacon Super 5%SC, and Tilt 25 EC and reveal that all the fungicides proved to be effective in the management of rice blast disease. Usman *et al.* (2009) <sup>[13]</sup> proved the efficacy of Rabicide, Nativo and Score against leaf and neck blast in rice. They found effective in reducing the disease percentage of leaf and neck blast. Balgude and Gaikwad (2016) <sup>[3]</sup> tested modern broad-spectrum fungicides viz., trifloxystrobin 25% + tebuconazole 50%, kresoxim methyl and azoxystrobin along with previously recommended fungicides like tricyclazole, carbendazim and propiconazole against rice diseases. Three sprays of fungicide combination viz., trifloxystrobin 25% + tebuconazole 50% (0.04%) at 15 days interval starting first spray immediately after disease appearance were found to be most effective in management of leaf blast, neck blast, node blast, sheath rot, leaf scald, brown spot and seed discoloration diseases and thereby enhancing the grain yield in paddy. Application of propiconazole significantly reduced the disease leaf blast severity (69, 73 and 70) and increased the grain yield (19, 12 and 21) of all the varieties as compared to their respective controls. It was concluded that timely spray of propiconazole reduce the disease severity and thereby increase the yield of the rice (Gupta *et al.*, 2013) <sup>[5]</sup>. Bag *et al.* (2016) <sup>[2]</sup> proved strobilurin based molecules like azoxystrobin, trifloxystrobin, metominostrobin manage the Sheath blight of rice caused by *Rhizoctonia solani* Kühn effectively and eco-friendly way than other commercially available fungicides.

### Acknowledgments

This project was sponsored by the Bayer Crop Science Limited. We great thanks to HOD, Plant Pathology, Indira Gandhi Krishi Vishwavidyalaya, Raipur and Director of Research, Indira Gandhi Krishi Vishwavidyalaya, Raipur for providing financial support.

### References

1. Ahmed MF, Khalequzzaman KM, Islam MN, Anam MK, Tahasinul MI. Effect of Fungicides Against *Bipolaris oryzae* of Rice Under *In vitro* Condition. Plant Pathology Journal. 2002; 1:4-7.

2. Bag MK, Yadav M, Mukherjee AK. Bioefficacy of Strobilurin Based Fungicides against Rice Sheath Blight Disease. Transcriptomics. 2016; 4:128.
3. Balgude YS, Gaikwad AP. Evaluation on the Efficacy of Modern Fungicides against Rice Diseases. Journal of Rice Research. 2016; 9(1):53-57.
4. Dutta D, Saha S, Ray DP, Bag MK. Effect of different active fungicides molecules on the management of rice blast disease. Intl J Agric Env Biotech. 2012; 5(3):247-251.
5. Gupta V, Shamas N, Razdan VK, Sharma BC, Sharma R, Kaur K *et al.* Foliar application of fungicides for the management of brown spot disease in rice (*Oryza sativa* L.) caused by *Bipolaris oryzae*. African Journal of Agricultural Research. 2013; 8(25):3303-3309.
6. IRRI. Standard evaluation system for rice. International Rice Research Institute, Philippines, 2014.
7. Kumar S, Kumar V, Naresh P, Singh R, Biswas S.K. Effect of Seed Treatment of Fungicides and Biocides against Spot Blotch of Wheat Caused by *Bipolaris sorokiniana*. Int J Curr Microbiol App Sci. 2019; 8(01):1223-1229.
8. Ma H, Chong K, Deng XW. Rice research: Past, present and future. Journal of Integrative Plant Biology. 2007; 49:729-730.
9. Rajasekar N, Jeyakumar P. Differential Response of Trifloxystrobin in Combination with Tebuconazole on Growth, Nutrient Uptake and Yield of Rice (*Oryza Sativa* L.). International Journal of Agriculture, Environment and Biotechnology. 2014; 6(1):87-93.
10. Reddy INBL, Kim BK, Yoon IS, Kim KH, Kwon TR. Salt Tolerance in Rice: Focus on Mechanisms and Approaches. Rice Science. 2017; 24(3):123-144.
11. Sandhya Y, Rajan CPD, Reddi MK, Rani AR. Efficacy of seed treatment with fungicides on the viability of sclerotia of *Rhizoctonia solani* admixed with the rice seed. Journal of Pharmacognosy and Phytochemistry. 2018; 7(3):3443-3449.
12. Urrea K, Rupe JC, Rothrock CS. Effect of Fungicide Seed Treatments, Cultivars, and Soils on Soybean Stand Establishment. Plant Disease. 2013; 97(6):807-812.
13. Usman M, Ghazanfar, Wakil W, Sahi ST, Saleem-il-Yasin. Influence of various fungicides on the management of rice blast disease. Mycopath. 2009; 7(1):29-34.
14. Waris M, Hemalatha P, Mishra MK, Kar AK. Management of Seed Borne Pathogens of Rice. Int J Curr Microbiol App Sci. 2018; 7(10):3638-3648.