Efficacy of Tilt (Propiconazole) Fungicide Applied at Different Rates and Growth Stages Against Spot Form Net Blotch Disease Caused by *Pyrenophora teres* f. sp. *maculata* on Food Barley in North Gondar Zone, Northwestern Ethiopia

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Abstract

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Spot form net blotch (SFNB) is one of the diseases which causes yield loss in barley. This study was initiated to evaluate the efficacy of Tilt fungicide application for the control of the spot form net blotch. Three Tilt rates applied at four growth stages were evaluated using factorial randomized complete block design at four sites with three replications in North Gondar province during 2023. Susceptible local variety Abat Gebs was sown at a rate of 100kg/ha in 3m^2 plot size. NPS Fertilizer at a rate of 121 kg/ha at planting, and urea at a rate of 100 kg/ha in two applications were used. Data on disease severity, yield and yield components were recorded. Analysis of variance of severities and area under disease progress curve, yield and yield components revealed that there was no interaction effect between fungicide rates and growth stages. There were statistically significant ($P \leq 0.05$) differences in the area under disease progress curve when the fungicide was applied at different growth stages. The lowest area under the disease curve was obtained when the fungicide was sprayed at the 39 growth stage at Debark and Dabat. The highest grain yield (4455.9 and 4377.7 kg/ha) was obtained from plots sprayed with Tilt at 39 growth stage followed by 49 growth stage at Debark. In general, 18.2 and 20.4% yield advantage was obtained from plots sprayed at the 39 growth stage compared to unsprayed control plots at Debark and Dabat, respectively. The severity of net blotch was highly reduced following foliar application of Tilt fungicide at the rate of 0.5 L/ha sprayed at the 39 growth stage. Therefore, this fungicide rate and the mentioned time of application are proposed to be integrated into the cultivation package of food barley.
Keywords: Barley, Tilt, fungicide, application rate, growth stage, grain yield.

Introduction

Barley, *Hordeum vulgare* L. is one of the most important staple food crops in the highlands of Ethiopia (Grando & Macpherson, 2005). It grows predominantly from 1500 to 3500 meters above sea levels. Barley productivity is low (2.5 t/ha) in Ethiopia as compared to world average of 3.05 t/ha and the reduction in productivity of the crop is mainly due to abiotic and biotic stresses (USDA, 2023).

Many plant pathogens reported on barley cause considerable loss in yield and quality, annually. Scald (*Rhynchsporium secalis*), blotch (*Pyrenophora teres*), spot blotch (*Cochliobolus sativus*), leaf rust (*Puccinia hordei*), smuts (*Ustilago hordei* and *U. nuda*) and eyespot (*Pseudocercosporella herpotrichoides*) remain to be the most widely distributed and economically important diseases (Bayeh *et al*, 2008; Kiros, 2004; Meki & Asnakech, 2004). In Ethiopia, net blotch caused by two forms of the fungus: the net type caused by *P. teres* f. sp. *teres* and the spot type caused by *P. teres* f. sp. maculata (Asnakech *et al*., 2005). Spot form net blotch symptoms appear as dark-brown, circular to elliptical lesions, surrounded by chlorotic or necrotic halos (Liu *et al*., 2011). Losses caused by spot blotch are variable depending on environmental factors, stubble management practices, crop and cultivar rotations and timely application of fungicides (Turkington *et al*., 2015). Yield losses from blotch in malting and food barley were studied in 2002 and 2003, showing losses of 31-41% at Genna and 27-59% at Bona in Ethiopia (Bekele, 2005). Many review by Dereje & Yaynu in 2001 reported yield losses of up to 34% due to the same disease on barley. Similarly, yield losses of 4 to 44% were reported for spot form of net blotch (SFNB) (McLean *et al*. 2016). Losses can be reduced by crop rotation, fungicide application and the deployment of resistant cultivars, which are the three main components of integrated spot blotch management in barley (Turkington *et al*., 2011). Research on different components for controlling barley foliar diseases in Ethiopia's Amhara region remains limited. Accordingly, the present study aimed to evaluate efficacy of application rate and time of Tilt application against spot forming net blotch on barley under field conditions.

Materials and Methods

Experimental site

The experiment was conducted at Dabat and Debark in Gondar Agricultural Research Station and at a farmer's field in North Gondar. Dabat site is located at 12.93178N and 37.74412 E, and an altitude of 2628 m.a.s.l. and Debark located at 13°08′N and 37°54′E, and an altitude of 2850 m.a.s.l. The mean annual rainfall for the areas ranges from

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1250 to 1565 mm. Most of the rain falls between April and September with peaks in July and August. The minimum annual temperature ranges between 4.6°C and 24.5°C. Average temperature is 16.6°C and the soil type is classified as cambisol and vertisol (BMA, 2022).

Treatments and experimental design

A total of twelve treatments and a control were evaluated at spot form net blotch disease hot spot areas of Dabat and Debark station and on a farm in the 2023 cropping season. Efficacy of Tilt (Propiconazole 250 g/L) fungicide was evaluated at three rates (0.5 and 0.75 and 1 L/ha) applied at four decimal growth stages of barley (McLean *et al*., 2016) (Table 1). An unsprayed treatment was used as control. Abat Gebs, local susceptible variety, was used at a seed rate of 100 Kg/ha. The experiment was laid out in randomized complete block design (RCBD) with factorial arrangement in three replications. The plot size was 3 m^2 (1.2 m width and 2.5 m length) with six rows of barley and 4 harvestable central rows. A recommended spacing of 20 cm among rows was used. Spacing of 0.75 m and 1.5 m between plots and replications was used, respectively. Fertilizer NPS at a rate of 121 kg/ha at planting, and urea at a rate of 100 kg/ha in two splits (half at planting and half at tillering stage of barley) were applied. Hand weeding was done at tillering, stem elongation and heading growth stages of the crop. Harvesting was done after maturity from a plot of 2 m^2.

Disease Assessment

Disease severity was visually scored as reported earlier (Daba *et al*., 2019) using a 0-9 scale, for barley infection with *Pyrenophora teres* f. sp. *maculata*. Disease severity was assessed every 10 days, with four evaluations conducted at Dabat due to the early onset of the disease, whereas three assessments were performed at Debark. Disease data were further converted to percent disease index (PDI) as reported by Silvar *et al*. (2009).

$$\text{PDI}=\frac{\text{Sum of individual numerical rating}}{\text{Total No.of plants assessed} \times \text{Max. score in scale}}\times 100$$

Table 1. Fungicide rates applied at different growth stages of food barley used in the experiment.

Growth stages	Decimal growth stages	Tilt (Propiconazole) rate (L/ha)
Stem elongation	33 (Third node detectable) (Early)	0.50
		0.75
		1.00
	39 (Flag leaf blade all visible) (Mid)	0.50
		0.75
		1.00
Booting	45 (Flag leaf sheath (Boots) swollen)	0.50
		0.75
		1.00
	49 (First awns visible) or 51(Late)	0.50
		0.75
		1.00

Area under disease progress curve (AUDPC) was calculated using the adapted formula by Cooke (2006):

$$\text{AUDPC} = \sum_{i=1}^{n-1}(0.5(X_i + X_{i+1}))\,(t_{i+1} - t_{\text{i}})$$

Where, x_i= The average coefficient of infection of the i^{th} note, x_{i+1} = The average coefficient of infection of the $i+1^{th}$ note, t_{i+1}- t_i= The number of days between the i^{th} note and the $i+1^{th}$ note; n= Number of observations. Since incidence and severity were expressed in percentage and time in days, AUDPC was expressed in %-days.

Yield and yield components

Plant height (PH, cm)- the height of 10 randomly sampled plants from each plot was measured from the base at the ground to the tip of the terminal spikelet excluding awns at maturity and the average of the ten observations was used for analysis.

Spike length (SL, cm)- The average length of the spike from its base to the tip of the highest spikelet excluding the awns was recorded in main tillers of ten randomly taken plants in each experimental unit at maturity.

Number of seeds per spike (SPS)- Total numbers of seed on main spike of all ten plants were counted at the time of maturity and average was recorded and used for analysis.

Grain yield (GY) (kg/ha)- Grain yield in grams obtained from four harvestable row of each plot was measured using sensitive balance and converted to kilogram per hectare after grain moisture is adjusted to 12.5%. Grain moisture content was measured using Dickey-John Grain Analysis Computer (GAC) 2100 Moisture Tester. Then, grain yield was adjusted using the formula:

$$\text{GY}_{\text{Adj}} = \left(\frac{100 - \text{y}}{100 - \text{x}}\right) * \text{GY}_{\text{Unadj}}$$

Where, GY_{Adj} = adjusted grain yield at 12.5% moisture content, y = the actual grain moisture content of the sample measured using GAC 2100 Moisture Tester, x = the standard moisture content of bread wheat (12.5%) and GY_{Unadj} = unadjusted grain yield.

Thousand kernels weight (TKW)- TKW was recorded from randomly taken pure thousand kernels and weighed using sensitive balance in grams.

Yield loss- Yield loss due to spot form net blotch was measured as percentage yield reduction of unsprayed plots compared with the most integrated plot (Nemomsa & Amsalu, 2020):

$$\text{RL }(\%) = \frac{(\text{Y}_1 - \text{Y}_2)\text{ X }100}{\text{Y}_1}$$

Where, RL = Relative loss (reduction of the parameters yield); Y_1= mean of the respective parameter on maximum protected plot; Y_2= mean of the respective parameter in other treatments and unprotected plot

Accordingly, in this trial, relative seed yield loss due to spot form net blotch was measured as percentage yield reduction of unsprayed plots compared with the factory recommended rate (0.5 L/ha). Relative yield loss was also measured on percentage yield reduction of unsprayed plots as compared to the treatment at the recommended growth stage (39 GS).

Cost benefit assessment

Partial budget analysis was done by considering the variable cost available in the respective treatment for computing net benefits and marginal rate of returns (Tamene & Zerihun, 2020). For this purpose, yield obtained from each treatment was downward adjusted by 10% in order to minimize yield inflation assumed to be caused by harvest from small experimental plots. To measure the increase in net return associated with each additional unit of cost (marginal cost), the marginal rate of return (MRR) was calculated as: MRR = $\Delta NI/\Delta IC$, Where, MRR is marginal rate of returns, ΔNI = change in net income compared with untreated check, ΔIC= change in input cost compared with untreated check.

The average prices of relevant inputs required to do the partial budget analyses were collected from different sources. Accordingly, the prices of fungicide during the planting of this experiment were collected from Gondar town. Accordingly, the price of Tilt was 1600 Ethiopian Birr (ETB)/L. The field prices of grain yield at the district local market around the study area were used. Accordingly, prices of grain yield of barley were 53 ETB/kg and labor cost used and knapsack sprayer rent were 300 Birr/person/day and 50 Birr, respectively.

Statistical analysis

Analysis of variance was done for disease parameters (severity for each day after planting and area under disease progress curve), yield and yield components. Least significant difference (LSD) values were used to identify significant differences among treatments means at 5% probability level. ANOVA was performed using General Linear Model (GLM) using SAS software version 9.0 (SAS, 2002).

Results and Discussion

Analysis of variance was done separately for each location. Growth stage application by fungicide rate interaction effects did not show significant effect at P=0.05 for all parameters in the two locations, whereas the main effects (i.e. growth stages and fungicide rates) have showed significant effect (P=0.05) on disease severity, AUDPC, yield and yield related traits. Thus, only the main effects on disease severity, AUDPC, yield and yield related traits were discussed (Table 2).

The efficacy of Tilt rates (0.5, 0.75 and 1.0 Ltha^{-1}) were evaluated against spot forming net blotch of barley. There was no significant difference (P>0.05) in severity among the different rates (0.5, 0.75 and 1.0 Ltha^{-1}) at 65, 75 and 85 days after planting (DAP) at Debark. Similarly, there was no significant difference at the initial severity (55 DAP) at Dabat but the rates showed a significant difference (P≤0.05) at 65, 75 and 85 DAP. On the final severity score (85 DAP), the lowest (39.9%) disease severity was obtained from 0.75 L/ha sprayed plots, followed by 1 L/ha sprayed plots (39.91%), whereas the highest disease severity (60.37%) was recorded from the control unsprayed plots (Table 3). More or less similar results were obtained earlier for the control of this disease in other regions of Ethiopia (Bekele *et al.,* 2004; Tamene & Zerihun, 2020).

The Analysis of variance of area under disease progress curve (AUDPC) revealed that there were also no statistically significant (P>0.05) difference between factory recommendation (0.5 L/ha) and the new tested rates (0.75 L/ha and 1 L/ha) sprayed plots both at Debark and Dabat in the 2023 cropping season. Even though there was no significant difference, the lowest AUDPC was observed on the 1 L/ha sprayed plots (798.15 %-days) at Debark and 0.75 L/ha and 1 L/ha sprayed plots (901.38 and 903.70 %-days), respectively at Dabat, whereas the highest was recorded for the control unsprayed in the 2023 cropping season at Debark and Dabat locations (Table 3).

Table 2. Analysis of variance of treatments at Debark and Dabat in 2023**.**

	Source							
	GS		Rate		GS*rate		Error	
Description	**Debark**	**Dabat**	**Debark**	**Dabat**	**Debark**	**Dabat**	**Debark**	**Dabat**
DF	3	3	2	2	6	6	58	58
S55DAP	-	260.59*		2.922 ns		10.774 ns		37.703
S65DAP	151.93*	605.55*	20.57 ns	61.05*	12.23 ns	32.438 ns	23.82	21.097
S75DAP	757.98*	1277.6*	2.90 ns	72.98*	144.98 ns	52.28 ns	96.08	32.24
S85DAP	811.36*	1278.16*	13.15 ns	72.49*	56.48 ns	52.08 ns	199.44	31.44
AUDPC	222522*	575067*	991 ns	53461	37755	21473 ns	26609	2161
PH	11.383ns	4.2390	26.62 ns	1.561	19.31 ns	11.669 ns	67.03	9.578
SL	0.11370 ns	0.04162 ns	0.1388 ns	0.1851 ns	0.10968	0.19273	0.679	0.147
SPS	11.0798 ns	4.31593 ns	2.7860 ns	2.40292	7.0889 ns	1.89606 ns	20.96	5.869
STW	146.245 ns	55.4683 ns	89.597 ns	18.082 ns	47.486 ns	40.5459 ns	53.65	27.29
YLD	1649885*	798486*	214653 ns	8142 ns	149613 ns	161831 ns	423812	191909

Note: GS = Growth stage, DF = Degree of freedom, S = Severity, DAP = Days after planting, PH = Plant height, SL = Spike length, SPS = Seeds per spike, TSW = Thousand seeds weight, YLD =Yield, * = significant at 5%, ns = non-significant.

Table 3. Effect of Tilt application on disease severity and area under diseases progress curve of spot blotch disease on food barely at Debark and Dabat locations during 2023 growing season.

Tilt application rate (L/ha)	Disease Severity (%) at days after planting (DAP)								
	Debark location				Dabat location				
	65 (Initial)	75	85 (Final)	AUDPC (%-days)	55 (Initial)	65	75	85 (Final)	AUDPC (%-days)
0.5	29.53	38.79	46.29	808.33	14.90	28.50 a	37.68 a	42.13a	984.26
0.75	28.54	39.39	46.29	810.02	14.26	25.74 b	34.25 b	38.71b	901.38
1.0	27.68	38.79	45.00	798.15	14.82	25.74 b	35.45 ab	39.91 ab	903.70
$LSD_{0.05}$	2.82	5.66	8.15	94.26	3.55	2.65	3.28	3.23	84.94
Growth stage									
33	28.27 b	37.66 b	44.57 b	785.79 b	9.13 b	23.83b	34.79 b	39.26 b	861.7 b
39	24.81 c	27.14 c	39.12 b	698.59 b	16.17 a	19.87 c	26.42c	30.20 c	742.6 c
45	31.77 a	48.27 a	55.16 a	961.69 a	15.56 a	30.99 a	35.06 b	39.51 b	948.8 b
49	29.49 b	36.91 b	44.57 b	775.92 b	17.78 a	31.96 a	46.91 a	51.4 a	1166.0 a
$LSD_{0.05}$	3.25	6.54	9.42	108.84	4.10	3.06	3.79	3.74	98.08
Control mean	34.8	52.6	57.41	1044.44	20.03	37.78	55.9	60.37	1387.04
CV	17.07	25.14	30.8	20.25	41.89	17.23	15.86	13.93	15.81
Mean	28.9	38.9	45.9	805.50	14.66	26.67	35.80	40.25	929.78

DAP= Days after planting, DE= Debark, DA= Dabat and AUDPC= Area under disease progress curve. Values followed by the same letters in the same column are not significantly different at P=0.05.

Significant differences (P=0.05) in disease severity were obtained following fungicidal sprays applied at different growth stages at Debark location. On the first observation (65 DAP) the highest disease severity was recorded from the unsprayed control treatment (34.8%), followed by the plots sprayed at the 45 growth stage (45 GS) (31.77%), whereas the lowest disease severity (24.81%) was recorded from plots sprayed at 39 GS, followed by plots sprayed at 33GS (28.27%).

At the last observation (85 DAP), the lowest disease severity (39.12%) was recorded from plots sprayed at 39 GS, and the highest disease severity was recorded from the unsprayed control plot (57.41%). More or less, similar results were obtained at the Dabat location (Table 3). An earlier study on net blotch of malt barley indicated that application of Tilt 250 EC at 7-10 days intervals, at least one-time fungicide application at GS 39-41 provided effective net blotch management and improved malt barley yield and yield related malt quality parameters (Wubishet *et al.,* 2015).

There were significant differences (P=0.05) in the area under disease progress curve (AUDPC) of plots sprayed at different growth stages at both locations Debark and Dabat. At Debark the highest AUDPC was obtained from the unsprayed control treatment (1044.44 %-days) followed by plots sprayed at 45GS (961.69 %-days), whereas the lowest was obtained from plots sprayed at 39GS (698.59%-days) followed by 49 GS sprayed plots (775.92). Similar results were obtained at Dabat location (Table 3). These results were in agreement with a previous research (McLean *et al*., 2016) from Australia which demonstrated that the application of the foliar fungicide Tilt effectively suppressed the spot form of net blotch. The level of disease control varied across different experiments, seasons, and crop growth stages. Notably, treatments applied at the flag leaf stage (39 GS) generally resulted in the most significant disease suppression.

Linear regression analyses of AUDPC and average grain yield was carried out, to evaluate the cause and effect relationship of spot forming net blotch with food barley production regarding fungicide rates used and time of application (growth stages). There was a significant negative relationship between AUDPC and average grain yield (Figure 1-A and 1-B). The damage coefficient (b) (-2.458 at Debark and -1.088 at Dabat) was obtained from the regression equation for each location. Based on the linear regression analysis result (R^2), the average grain yield varied about 95.1% at Debark and 71.0% at Dabat due to the mean AUDPC value of spot forming net blotch and the remaining portion may be due to other factors (Figure 1-A and 1-B).

The Analysis of variance of yield and yield related traits revealed that there were significant difference at P=0.05 among treatments at different growth stages and grain yield, but there was no significant difference at P=0.05 for plant height, spike length, and seeds per spike at both locations (Table 3). The maximum grain yield was recorded from Tilt fungicide sprayed at 39 GS (4455.9 kg/ha) followed by plots sprayed at 49 GS (4377.7 Kg/ha), whereas the lowest grain yield was recorded from the unsprayed control (3644.1 Kg/ha) at Debark in the 2023 cropping season. Similarly, at Dabat the lowest grain yield was obtained from the unsprayed control plots (2774 Kg/ha), and the highest grain yield was obtained from plots sprayed at 45 GS (3556.0 Kg/ha), followed by plots sprayed at 39 GS (3483.2 Kg/ha) (Table 4).

The progress of spot form net blotch disease exhibited a linear trend across various growth stages (GS), with severity levels in the unsprayed control plots increasing from 17 at 55 DAP to 71% at 85 DAP. Plots sprayed at 33 GS showed a severity range of 9 to 50%, indicating effective early intervention, whereas those treated at 45 GS exhibited a severity of 15 to 53%. Plots sprayed at 49 GS had severity level of 17-55%. The lowest rate of disease severity was at

39 GS (16-44%). This pattern emphasizes the significance of timely disease management, as earlier applications resulted in reduced disease severity (Figure 2).

Relative yield loss

There was very slight yield loss among the different fungicide rates applied, with 15.7% yield loss occurred in the unsprayed control. Across Tilt application rates (L/ha), relative yield loss was 0.00% at 0.5 L/ha, 0.05% at 0.75 L/ha, and 2.59% at 1.0 L/ha, while the rate-control (unsprayed) recorded 15.7% yield loss. When Tilt was evaluated by growth stage, yield loss was 6.3% at GS33, 8.0% at GS45, and 6.0% at GS49, compared with 19.2% in the unsprayed control with higher yield loss occurred in the unsprayed control at Debark and Dabat locations.

Partial budget analysis

The results of partial budget analysis data of fungicide rate are summarized in Table 5. Treatments produced higher net benefit relative to the control treatment, suggesting the feasibility of fungicide application for barley production in the study districts. Thus, spraying Tilt fungicide at 0.5 L/ha had high net profit with a marginal rate of return of 1461% (Table 5).

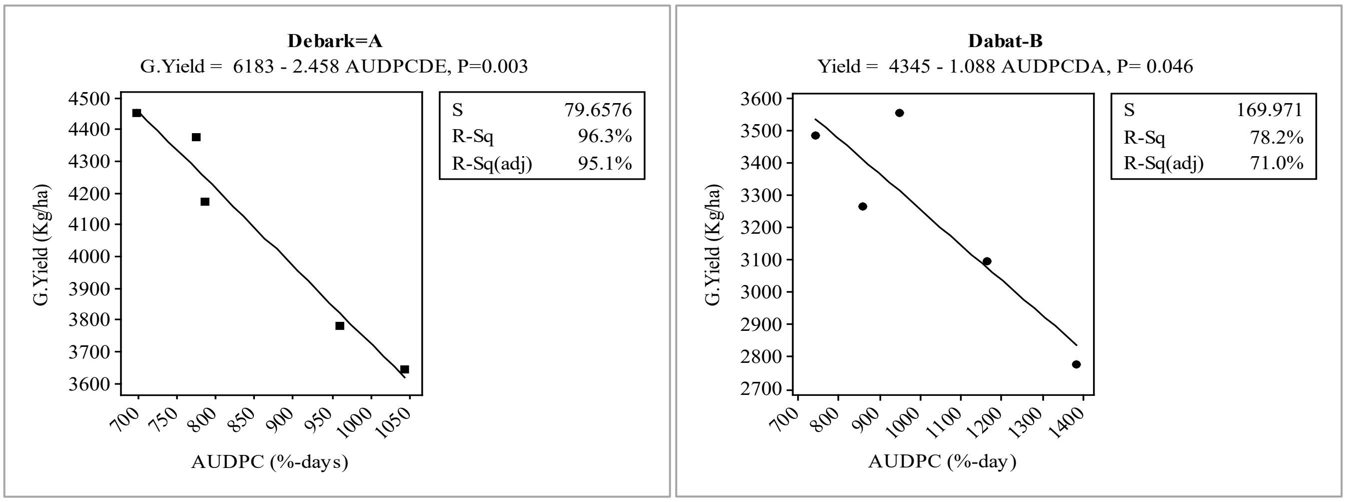

Figure 1. Relationship between grain yield and area under disease progress curve of spot blotch on food barely at Debark and Dabat locations.

Table 4. Effect of Tilt fungicide application at different growth stages on yield and yield components of food barely infected with spot blotch disease at Debark and Dabat locations in 2023.

	PH (cm)		SL (cm)		SPS		TSW (Gram)		YLD (Kg/ha)	
	DE	DA	DE	DA	DE	DA	DE	DA	DE	DA
Tilt application rates (L/ha)										
0.5	120.05	108.90	7.14	7.58	52.99	46.49	48.884	43.59	4252.80	3360.0
0.75	121.94	108.74	7.00	7.53	53.68	46.99	51.594	45.19	4249.30	3360.1
1.0	120.18	108.40	7.01	7.40	53.38	46.41	52.625	44.97	4087.30	3328.1
$LSD_{0.05}$	4.73	1.79	0.48	0.22	2.64	1.40	4.230	3.02	376.18	253.14
Growth stage										
33	121.59	108.31	7.11	7.54	52.56	46.41	51.24 ab	45.69	4173.2 ab	3264.5 ab
39	121.14	108.22	7.12	7.51	54.17	46.06	53.18 a	43.07	4455.9 a	3483.2 a
45	120.34	109.06	7.03	7.43	52.81	47.13	46.95 b	43.11	3779.0 b	3556.0 a
49	119.82	109.14	6.94	7.52	53.87	46.93	52.78 a	46.46	4377.7 a	3093.9 b
$LSD_{0.05}$	5.46	2.07	0.55	0.26	3.05	1.62	4.89	3.48	434.38	292.3
Control mean	119.4	107.00	6.80	7.38	48.5	44.36	46.4	42.1	3644.1	2774
CV	6.78	2.85	11.69	5.11	8.58	5.20	14.35	11.72	15.51	13.08
Mean	120.72	108.68	7.05	7.50	53.35	46.63	51.03	44.58	4196.4	3349.4

DE= Debark, DA= Dabat, PH= Plant height, SL=Spike length, SPS= Seeds per spike, TSW= Thousand seeds weight, YLD=Yield, DAP= Days after planting. Values followed by the same letters in the same column are not significantly different at P=0.05.

Table 5. Partial economic analysis of fungicide applications at different rates.

Tilt rate (L/ha)	AAY (kg/ha)	Price (Birr)	Inputs cost (Birr)				Total Input costs (Birr)	DA	MB	MC	MRR
			Fungicide	Labour	Knapsack Rent	Water					
Control	2888.145	153,071.7	-	-	-	-	-				
0.5	3425.76	181,565.3	800	900	50	200	1,950.00		28,493.60	1,950.00	1461
0.75	3424.23	181,484.2	1,200	900	50	200	2,350.00	D			
1.0	3336.93	176,857.3	1,600	900	50	200	2,750.00	D			

DA=Dominant analysis, MC= Marginal cost, MB=Marginal benefit, MRR=Marginal rate of return, AAY= Adjusted average yield.
1 USD= 142 Ethiopian Birr

Daily disease severity assessment after planting, showed that there was a significant correlation (P=0.05) between the area under disease progress curve and yield following the application of the fungicide at different growth stages. Foliar application of Tilt fungicide at the rate of 0.5 L/ha at 39 GS (Flag leaf completely visible) reduced the severity of spot blotch more than other treatments. Spraying Tilt fungicide reduced spot blotch severity by 16 to 30% at Dabat and 24 to 39% at Debark, when applied at 39 GS. The partial budget analysis indicated that spraying Tilt at 0.5 L/ha had high net profit and the corresponding marginal rate of return was 1461%. Therefore, for efficient management of spot blotch disease of barley caused by *P. teres* f. sp. maculate, the use of Tilt fungicide at 0.5 L/ha at 39 GS is proposed to be incorporated in the cultivation package of barley crops in North Gondar Zone, Northwestern Ethiopia.

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الملخص

أزانَو، أصفاو، أسيفا سينتايو، تسفاي أليمو وتيوودروس تسفاي. 2026. فعالية مبيد الفطور "تيلت" (بروبيكونازول) عند تطبيقه بمعدلات ومراحل نمو مختلفة ضد مرض التبقع الشبكي (*Pyrenophora teres* f. sp. *maculata*) على الشعير الغذائي في منطقة شمال غوندار، شمال غرب إثيوبيا. مجلة وقاية النبات العربية، 44(1):48-54. https://doi.org/10.22268/AJPP-001379

يُعدّ مرض التبقع الشبكي على الشعير أحد الأمراض التي تُسبب خسائر في إنتاجية محصول الشعير. تمّ تنفيذ هذه الدراسة لتقييم فعالية تطبيق مبيد الفطور "تيلت" في مكافحة مرض التبقع الشبكي. تمّ اختبار ثلاثة معدلات من مبيد "التيلت" عند أربع مراحل نمو مختلفة، باستخدام تصميم القطاعات العشوائية الكاملة بعاملين في أربعة مواقع مختلفة بمنطقة شمال غوندار خلال موسم 2023، مع ثلاثة مكررات لكل معاملة. تمّت زراعة الصنف المحلي الحساس "أبات غبس" بمعدل 100 كغ/هكتار في قطعة تجريبية بمساحة 3 م². تمّ استخدام سماد NPS بمعدل 121 كغ/هكتار عند الزراعة، واليوريا بمعدل 100 كغ/هكتار على دفعتين. تمّ تسجيل بيانات حول شدّة المرض، والإنتاجية، ومكونات الغلّة/الانتاجية. أظهرت نتائج تحليل التباين لشدة المرض، ومنحنى تطور المرض، والإنتاجية، ومكوناتها، عدم وجود تأثير تفاعلي معنوي بين معدلات المبيد المستخدمة ومراحل النمو. ومع ذلك، وُجدت فروق معنوية إحصائياً عند مستوى احتمال 5% في المساحة تحت منحنى تقدم المرض تبعاً لمراحل تطبيق المبيد. تم تسجيل أدنى قيمة للمساحة تحت منحنى المرض عند تطبيق المبيد في مرحلة النمو 39 في منطقتي ديبارك ودابات. تمّ تحقيق أعلى إنتاجية للحبوب (4455.9 و 4377.7 كغ/هكتار) عند الرش بمبيد تيلت في المرحلة 39 تليها المرحلة 49 في موقع ديبارك. عموماً، تمّ تحقيق زيادة في الإنتاجية بنسبة 18.2 و 20.4% في ديبارك ودابات، على التوالي، عند رش المبيد في المرحلة 39 مقارنةً بالقطع غير المعاملة. تمّ تقليل شدة الإصابة بمرض التبقع الشبكي بشكل كبير عند تطبيق المبيد بمعدل 0.5 ليتر/هكتار خلال المرحلة 39 من النمو. لذلك، يُوصى بإدراج استخدام هذا المبيد خلال المرحلة المشار إليها ضمن الحزمة التقنية لزراعة الشعير الغذائي.

كلمات مفتاحية: الشعير، تيلت، مبيد فطري، معدل التطبيق، مرحلة النمو، إنتاج الحبوب.

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