

# Evaluation of Variety by Fungicide for the Management of Wheat Septoria Blotch Disease

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## Research Article

**Received:** 15-January-2020, Manuscript No. JAAS-23-6396; **Editor assigned:** 20-January-2020, Pre QC No. JAAS-23-6396 (PQ); **Reviewed:** 03-February-2020, QC No. JAAS-23-6396; **Revised:** 03-July-2023, Manuscript No. JAAS-23-6396 (R); **Published:** 31-July -2023, DOI: 10.4172/2347-226X.12.2.002

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**Citation:** Tomas Z, et al. Evaluation of Variety by Fungicide for the Management of Wheat Septoria Blotch Disease. J Agri Allied Sci. 2023;12:002.

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## ABSTRACT

The production and productivity of wheat in the country and in the region is below the biological potential of the crop. The low production is due to diverse biotic and abiotic constraints. Of them, diseases are the most important agents that limit the productivity. Currently, septoria blotch is one of the major wheat diseases. Therefore, in line with resistant breeding evaluation of effective fungicides is important to manage it and reduce the crop yield. So, this research was carried out to evaluate the effectiveness of variety by fungicides for the management of wheat septoria blotch. The response of wheat varieties to septoria blotch disease under natural infestation was recorded in terms of severity and analyzed using SAS version 9.1. The result showed that, application of the three fungicides significantly reduces septoria blotch severity. The lowest yield of 3582 kg/ha, 4429 kg/ha and 3405 kg/ha in 2016 and 3391 kg/ha, 3445 kg/ha and 3542 kg/ha in 2017 on unsprayed treatments of Tay, Danda'a and Gambo, respectively. At both locations the highest severity of septoria was recorded on unsprayed treatment on Gambo which is already reported as susceptible for it. On the grain yield among fungicide sprayed and none sprayed there is statistically significant difference regardless of fungicide variation. Therefore, the alternative use of fungicides of Tilt, RexDue and Bylathon can minimize wheat yield loss due to septoria blotch.

**Keywords:** Septoria blotch; Severity; Fungicides; Wheat varieties

## INTRODUCTION

Wheat (*Triticum aestivum* L.) is among the major cereal crops cultivated in Ethiopia. It was cultivated in about 1.71 million hectares of land with productivity of 2.63 tons per hectare. This low yield is attributed to multi-faced abiotic and biotic factors such as lack of improved varieties, low and uneven distribution of rainfall, poor agronomic practices, insect pests and diseases. Among the biotic yield limiting factors, diseases are the most important; of these septoria leaf blotch (*Septoria tritici*), Rusts (*Puccinia* spp), Fusarium head blight (*Fusarium gramnearum*), Leaf spot (*Helminthosporium* spp) and Tan spots (*Helminthosporium tritici-repentis*) are the foremost diseases [1-4].

*Septoria* leaf blotch is characterized by irregular necrotic lesions interspersed with small black fruiting bodies (*Pycnidia*) on the leaves and stem. It is these lesions that reduce the green leaf area of the plant and which, particularly if present on the upper leaves during grain filling, can reduce yield. Under favorable growing-conditions, yield losses can reach 30%-53% especially with high yielding and susceptible cultivars. This higher yield loss could be reached in regions with high relative humidity (85%) and optimum temperate between 20°C and 28°C. In Ethiopia the yield loss of 25% to 41% incurred at holeta agricultural research center on susceptible wheat cultivars. Fungicides application and the development of resistant wheat cultivars are the strategies to alleviate septoria leaf blotch. Therefore, In line with resistant breeding evaluation of effective fungicides is important to manage it and reduce the crop yield. So, this research was carried out to evaluate variety by fungicide for the management of wheat septoria blotch [5-7].

## MATERIALS AND METHODS

### Description of the study areas

Hosanna site is found in Haddiya zone which is located at 7°34'04" N and 37°51'22" E at about 2306 Meters above sea level (m.a.s.l). It receives an average annual rainfall of 1153 mm. The monthly average minimum and maximum temperatures are 10.3°C and 23°C, respectively. The dominant soil type is nitosol and slightly acidic. It belongs to the sub humid agro climatic zone. Whereas, Kokate is located at 6°85'28" N and 37°76'10" E at about 2156 meters above sea level (m.a.s.l). It receives an average annual rainfall of 1552.1 mm. The monthly average minimum and maximum temperatures are 13.6°C and 24.2°C, respectively. The dominant soil type is clay loam [8].

### Experimental procedure and design

On the study three fungicides (Tilt 0.5 l/ha, Rexdo 0.5 l/ha and Bylaton 2 l/ha) were evaluated for their efficiency to manage wheat septoria blotch on three wheat varieties (Tay, Danda'a and Gambo) with different resistance level for septoria blotch. The treatments were planted at Kokate and Hosanna on RCBD of three replications with factorial arrangement in 2016 and 2017. The response of treatments to septoria under natural infestation condition was taken in terms of incidence and severity and the data was analyzed using SAS software (version 9.1) and means were separated at 5% of level of significance [9].

## RESULTS AND DISCUSSION

In this study application of the three fungicides significantly reduces septoria blotch severity. The lowest yield of 3582, 4429 kg/ha and 3405 kg/ha in 2016 and 3391 kg/ha, 3445 kg/ha and 3542 kg/ha in 2017 on unsprayed treatments of Tay, Danda'a and Gambo, respectively (Table 1). At both locations the highest severity of septoria was recorded on unsprayed treatment on Gambo which is already reported as susceptible for it. On the grain yield among fungicide sprayed and none sprayed there is statistically significant difference regardless of fungicide variation [10-13].

**Table 1.** Average percent septoria leaf blotch severity in wheat varieties treated with different fungicides and their grain yield per hectare at Hossana and Kokate in 2016 and 2017.

| Variety | Fungicide          | 2016 year of production |                     | 2017 year of production |                     |
|---------|--------------------|-------------------------|---------------------|-------------------------|---------------------|
|         |                    | Average severity (%)    | Grain yield (Kg/ha) | Average severity (%)    | Grain yield (Kg/ha) |
| Tay     | Without fungicides | 55.76                   | 3582.3              | 59.46                   | 3391.0              |
|         | Tilte              | 30.66                   | 5556.0              | 40.74                   | 5036.9              |
|         | Rexdue             | 28.81                   | 5777.5              | 44.23                   | 4900.9              |
|         | Bylaton            | 39.51                   | 4647.7              | 51.85                   | 4274.0              |
| Danda'a | Without fungicides | 62.96                   | 4429.2              | 63.78                   | 3445.2              |
|         | Tilte              | 29.63d                  | 5940.9              | 39.71                   | 4654.3              |
|         | Rexdue             | 23.46                   | 6117.5              | 25.34                   | 5170.3              |
|         | Bylaton            | 45.47                   | 4608.5              | 43.46                   | 4676.1              |
| Gambo   | Without fungicides | 74.49                   | 3404.7              | 74.07                   | 3541.9              |
|         | Tilte              | 39.92                   | 5115.8              | 38.68                   | 4880.3              |
|         | Rexdue             | 36.63                   | 5073.8              | 39.50                   | 4907.6              |
|         | Bylaton            | 41.99                   | 4944.3              | 47.97                   | 4170.3              |
| CV (%)  |                    | 25.27                   | 13.95               | 30.13                   | 13.39               |

One of the most significant foliar diseases of wheat is *Septoria tritici* Blotch (STB), which is brought on by the ascomycete fungus *Mycosphaerella graminicola* (asexual stage: *Septoria tritici*). Necrotic lesions on leaves and stems that form after infected cells collapse are the hallmark of STB, which is more common in cool, rainy weather. Currently, it is the most significant disease affecting wheat in Europe and it ranks in the top two or three illnesses affecting this crop's economic viability in the US. Applications of fungicides are made frequently, which raises the STB-related expenses to the global economy.

Small chlorotic spots on the foliage that arise shortly after seedlings emerge in the autumn or spring are the first signs of STB. The lesions turn light tan as they grow and produce fruiting bodies that are deeper in colour. Especially on seedlings or leaves that were young when infected, lesions on adult leaves are frequently long, narrow and defined by leaf veins, but they can also be shaped irregularly or be oval. Adult lesions have asexual pycnidia or sexual pseudothecia, which are dark-colored fruiting structures. The lesions pycnidia or pseudothecia are evenly spaced because they grow in the host's substomatal cavities.

The name of the pathogen's sexual stage (teleomorph) is *Mycosphaerella graminicola*. Desmazieres originally identified *Septoria tritici*, an asexual (anamorph) stage, as the cause of STB in 1842. This organism is an ascomycete belonging to the family *Mycosphaerellaceae*, order *Capnodiales* and class *Dothideomycetes*. One of the major genera of plant pathogenic fungus, *Mycosphaerella*, contains the pathogen responsible for the banana black Sigatoka disease, *M. fijiensis*, as well as numerous other key infections of crucial agricultural crops. The barley pathogen *Septoria passerinii*, which causes speckled leaf blotch, is closely related to *M. graminicola*.

One of the most severe foliar wheat diseases in the European Union, *Septoria tritici* Blotch (STB), is caused by the bacterium *Zymoseptoria tritici*. Additionally, it is a well-known disease of wheat that is cultivated worldwide in temperate areas. We emphasise the significance of STB on wheat in the EU in this commentary. Understanding STB requires taking into account the host crop, the fungus that is the pathogen and their shared environment. Here, we take a look at the fungus as a whole and how it interacts with its host before concentrating on a more agricultural-focused analysis of the

effects STB has on wheat. We take into account the climatic and weather aspects that affect its severity and spread, make reference to agricultural practises that may lessen or increase its impact on crop production and assess the economic value of wheat as a crop for human consumption and animal feed in the UK and the EU. The cost of STB disease to EU agriculture is estimated in the end.

Wheat produced worldwide in temperate settings faces a major and enduring threat from *Septoria tritici* Blotch (STB). An major research effort to assess current disease control measures and explore for new ones has been sparked by this threat. Despite the enormous economic significance of this pathogen, it is difficult to find reliable information in peer-reviewed articles about yield losses or, more generally, the financial effects of disease. For instance, published STB disease losses from a single research in a specific area have been largely accepted in the literature as being applicable to losses worldwide.

Making decisions in the fields of agriculture, politics and economics shouldn't be based on such extrapolations. To create a more accurate image of the significance of STB in Europe, we set out to compile all information available and to do so from publicly accessible data bases, peer-reviewed scientific articles and websites. With the help of this combined data, we aim to be able to assess the threat that STB illness poses to Europe.

The crop farmed most extensively worldwide is wheat. According to [www.agrimoney.com](http://www.agrimoney.com), global harvests totaled 705 million metric tonnes in 2013-2014. In the EU, wheat rises from its global ranking as the second-most significant food crop (behind rice) to that of the most significant cereal. According to calculations based on the various EU member states produced more than 143 mmt of wheat in 2013/2014, 15% more than China, 35% more than India and 60% more than the USA. France and Germany are the two EU member states that produce the most wheat, accounting for over 26% and 17% of the EU's total harvest, respectively, while the UK produces about 8.5%.

## CONCLUSION

Regardless of resistant level, fungicide unsprayed treatment showed the lowest grain yield with respect to sprayed treatments. But, septoria severity as well as grain yield has no significant difference among fungicide sprayed treatments; however there was relatively low grain yield was obtained on some Bylathon sprayed treatments. Therefore, the alternative use of fungicides of Tilt, RexDue and Bylathon can minimize wheat yield loss due to septoria blotch.

In terms of food and commodities, wheat is enormously important to society and the economy throughout the EU. Currently, the fungus *Z. tritici*, which causes *Septoria tritici* blotch, is the most prominent disease of wheat. Our existing knowledge of *Z. tritici* points to a pathogen whose significance should not be understated. This fungus exhibits a level of evolutionary plasticity that may make it relatively simple for it to keep up with advancements in disease control. It is still difficult to fully comprehend the fungus as a whole and the subtle ways in which it interacts with wheat. Models intended to forecast disease outcome and the time of fungicide treatment would be improved with an accurate and thorough list of the events leading to complete infection.

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