RESEARCH NOTE/NOTA DE INVESTIGACIÓN

EFFECT OF SEED GALL NEMATODE, *ANGUINA TRITICI*, ON GRAIN YIELD OF BREAD WHEAT CULTIVAR UNDER FIELD CONDITIONS

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ABSTRACT

Tülek, A., A. Dababat, İ. Kepenekci, and İ. Öztürk. 2019. Effect of seed gall nematode, *Anguina tritici*, on grain yield of bread wheat cultivar under field conditions. Nematropica 49:59-62.

The effects of *Anguina tritici* on wheat yields and other agronomic components were investigated at Thrace Agricultural Research Institute, Turkey, during the 2015-2016 growing seasons. In the experiment, three different gall densities were used to determine the yield loss caused by the wheat gall nematodes on Selimiye bread wheat variety. The results showed that inoculation of seed gall nematodes at 10%, 20%, and 40% infected seed resulted in yield losses of 9.7, 21.5, and 27%, respectively, when compared to the non-inoculated control. The 1,000 kernel weight did not decrease by the 3 inoculum levels (P>0.05).

Key words: Anguina tritici, resistance, *Triticum aestivum*, wheat, wheat gall nematode, yield losses

RESUMEN

Tülek, A., A. A. Dababat, İ. Kepenekci, and İ. Öztürk. 2019. Efecto del nematodo de agalla de semilla, *Anguina tritici*, sobre el rendimiento de grano del cultivar de trigo harinero en condiciones de campo. Nematropica 49:59-62.

Los efectos de *Anguina tritici* en los rendimientos de trigo y otros componentes agronómicos se investigaron en el Instituto de Investigación Agrícola de Thrace, Turquía, durante las temporadas de crecimiento 2015-2016. En el experimento, se utilizaron tres densidades de agallas diferentes para determinar la pérdida de rendimiento causada por los nematodos de agallas de trigo en la variedad de trigo de pan Selimiye. Los resultados mostraron que la inoculación de nematodos de agallas en semillas infectadas al 10%, 20%, y 40% dio como resultado pérdidas de rendimiento de 9.7, 21.5, y 27%, respectivamente, cuando se comparó con el control no inoculado. El peso de 1000 granos no disminuyó en los 3 niveles de inóculo (P> 0.05).

Palabras clave: Anguina tritici, resistencia, *Triticum aestivum*, trigo, nematodo de agalla de trigo, pérdidas de rendimiento

Wheat is an indispensable crop for humanity with its 220 million ha cultivated area, 729 million tons of output, and its $53 million in trading value (Anonymous, 2014). One of the factors effecting

wheat yield and quality is plant-parasitic nematodes. The main nematodes causing damage to the wheat crop are *Heterodera* spp. (Dababat *et al.*, 2015), *Pratylenchus* spp. (Dababat *et al.*, 2016), *Anguina tritici* (Tülek *et al.*, 2015), *Ditylenchus dipsaci*, and *Meloidogyne* spp. (McDonald and Nicol, 2005). Although wheat gall nematodes have been brought under control in many countries, the nematode still exists wherever wheat is grown and remains common in Eastern Europe and in different parts of Asia and Africa (Agrios, 2005). Wheat seed gall is caused by the nematode *Anguina tritici*. Wheat seed gall nematode is considered an economically important pest of wheat (*Triticum* spp.) and rye (*Secale cereale* L.). It causes ear-cockle disease of wheat turning the seed into seed galls. Wheat seed gall nematode infects aboveground plant parts with symptoms usually appearing in wheat seedlings but are most noticeable prior to heading.

This nematode causes both quantitative and qualitative losses in wheat either by reducing its yield and its acceptability for human consumption due to flour colour change. Losses of 50% and 65% were reported in wheat and rye due to infection with the wheat gall nematodes, respectively (Leukel, 1957). Tülek *et al.* (2015) estimated yield losses caused by *A. tritici* averaging 55% in wheat cultivars Pehlivan, Selimiye, Gelibolu, and Kate-A (average yields = 3.74 t/ha) as compared to control plots (average yields = 8.38 t/ha). This study determined the yield losses associated with the nematode in the Selimiye bread cultivar.

To determine the effect of *A. tritici* on yield, trials were conducted at the Thrace Agricultural Research Institute in Edirne, Turkey, during the 2015-2016 growing season. All other cultural practices were applied as in conventional wheat cultivation.

To estimate yield loss caused by *A. tritici*, the bread wheat cultivar 'Selimiye' was used. Different ratios of galled grains constitute the characters. Seed galls had been collected from the previous year and were used as inoculum. Before sowing, the galled grains were classified according to their size by using the oblong sifter and seeds between the range of ≥2.0 mm and <2.2 mm were used. Then, 10 galled grains were randomly selected, and mean number of nematodes was determined (11,790 *A. tririci* per grain). Wheat seeds were adjusted with three different levels of galled grain to provide 40%, 20%, 10%, and 0% (control free from seed gall) ratios of seed gall to seed levels. The experiment was established in a completely randomized block design, and each treatment was replicated 4 times. Seeds were sown dry by driller at a seeding rate of 500 seeds/m^2. The seeds were sown in 6 rows of 20-cm apart and 5-6 cm deep. When grain moisture reached 10%, the plots were harvested by plot combine harvester, and yield was recorded.

Nematode population densities and yield data were subjected to analysis of variance (ANOVA) using Jump 5.0.1 statistical program. The means were compared by the least significant difference (LSD $P < 0.05$) if the F value was significant.

In the trial, deformations on leaves and spikes in vegetative and generative stages were extensively observed on plants in infested plots. At harvest, galled grains occurred extensively throughout infested plots.

Different seed gall ratios significantly and negatively affected yield when compared to the control. The losses in yield were distinct and positively correlated (r=0.92) with the increasing galled seed ratio and reached 9.7%, 21.5%, and 27% at inoculum levels of 10%, 20%, and 40%, respectively (Table 1).

Table 1. Effect of different inoculation levels of the seed gall nematode, *Anguina tritici,* on yield (T/ha) and 1,000 kernel weights (g) of wheat cultivar Selimiye under field conditions.

Initial galled seed ratio	Yield	Yield loss (%)	1,000 kernel weight
0 (Control)	4.446 a[z]	-	37.8 a
10%	4.013 a	9.7	38.0 a
20%	3.488 b	21.5	37.9 a
40%	3.245 b	27	37.2 a

[z] Within a column, means not sharing the same letters are different at $P < 0.05$ based on an LSD test.

In another study conducted by Tülek *et al*. (2015) to study yield losses in the wheat cultivars Kate-A, Pehlivan, Selimiye, and Gelibolu infected with *A. tritici* at a ratio of 35% of galled seeds, yield losses were estimated at 51.3%, 53.2% 56.6%, and 59.6%, respectively. Mohamedova and Piperkova (2013) found that wheat gall nematode reduced the number of spikes and increased the deformation of wheat plants in Enola bread wheat cultivar. Wheat grain yield decreased from 6.5 t/ha to 4.13 t/ha due to the infection with *A tritici*. In India, Kaushal (1998) reported annual wheat grain loss from *A. tritici* ranged between 1% to 9%.

It is considered that wheat gall nematode effects the yield in two ways. Firstly, galled grain rate obtained expresses directly the yield loss. Secondly, the plant is exposed to deformation because of the nematode damage in vegetative growing stage and cannot elongate stems and spike number per square meter decreases. Thus, the yield is affected adversely.

Wheat gall nematodes are found in farms where certified seeds are not used and where no seed-cleaning unit is employed. Tülek *et al.* (2017) found only 13 of 685 wheat seed samples from farmer stocks to be infested with seed gall nematode in 2015 in the Trakya Region, Turkey. The negative impact of *A. tritici* on grain yield and yield traits cannot be neglected, and the farmers in the region must be educated and encouraged to use certified wheat seeds. It is essential that the nematode must be monitored carefully. Another approach to manage losses in wheat to *A. tritici* is to generate resistant or tolerant cultivars using genetic resources that are available within the wheat germplasm.

ACKOWLEDGMENTS

This study is part of a research project supported by the General Directorate of Agricultural Research (GDAR), The Ministry of Agriculture and Rural Affairs (MARA).

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Received: *18/X/2017*
Recibido:

Accepted for publication: *18/XI/2018*
Aceptado para publicación: