

ASSESSING THE DAMAGE CAUSED BY APHIDS AT GRAIN SORGHUM CROP UNDER PSAMOSOILS IN SOUTHERN OLTENIA

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Abstract: The research was conducted during 2012-2014 to the culture grain sorghum, located under psamosoils, in southern Oltenia to assessing the implications of the attack of aphids (*Schizaphis graminum* Rond.) in physiology and plant productivity. Have been tested three insecticides with systemic and contact effect compared to untreated control, on a background of optimal application of other treatments to combat pathogens and weeds. The results obtained highlight the very good efficacy by Calypso 480 EC at a dose of 80 ml/ha, reducing by 81% the attack frequency of aphids, compared to the untreated control, where there was a 40.6% frequency. The attack frequency produced by aphids was positively correlated with plant transpiration rate ($r = 0.949$) and negatively with leaf chlorophyll content ($r = - 0.963^*$). Performing two treatments during the growing season with this systems product, in phases 4-5 and 6-8 leaves of the sorghum plant, prompted a maximum rate of photosynthesis at 15 o'clock and an increase in grain yield with 1905.7 kg/ha, very significantly compared to the untreated variant.

Keywords: attack frequency, pests, physiology, production

INTRODUCTION

Sorghum (*Sorghum bicolor*) is an important cereal crop world-wide that is widely cultivated for food, fiber, forage, ethanol, and sugar production (Li & Gu 2004; Liu et al., 2009). Sorghum plant has a high level of starch, sugar and fiber, and is one of the most important energy crops in the world. The damage caused by insects constitutes a negative impact on the production of biomass sorghum (Guo et al., 2011). In a study conducted in China is mentioned that the there are over 150 pests that can attack grain sorghum crop (Wu Yq & Huang, 2008). The success of cereal crops, industrial crops and fodder it is frequently conditioned by the occurrence of various diseases and pests, by attacking produced contributes to reducing the production potential of varieties and hybrids under the conditions agrotechnics insured (Paulian, 1981; Bărbulescu et al., 2002). Research at the Department of Entomology, University of California by Kinsey (1982) showed that aphid green (*Schizaphis graminum*) has registered a growth rate significantly higher on lines of sorghum sensitive where to electronically monitored a greater amount of saliva and phloem ingested. The results obtained at NARDI Fundulea on chemical control of aphid green cereals (Bărbulescu, 1972, 1985) have highlighted the role of insecticides, applied both preventive, as granules during sowing sorghum, and curative as foliar spray, depending on the evolution of maximum occurrence of aphids on sorghum.

MATERIALS AND METHODS

The research was conducted in 2012-2013 at Research & Development Center for Plant Growing on Sands Dabuleni, and aimed at evaluating the implications of the attack

produced by *Schizaphis graminum* (Rond) in plant physiology and productivity of sorghum grain. There were tested three insecticides (Faster 10EC - 0.03% Energy Confidor - 0.1%, Calypso 480EC - 80 ml/ha), with systemic and contact effect, compared to untreated control, on a optimum background application of other treatments to combat pathogens and weeds. The culture of sorghum was placed under irrigation conditions on a psamosoil, with a low natural fertility (humus 0.38 to 0.72%, and a $pH_{H_2O} = 6.8-7.1$). The phytosanitary treatments were applied in two-phase growing of sorghum, as follows: the first treatment was applied for 4-5 leaf stage and the second applied at the stage of 6-8 leaves of a plant of sorghum. It was determined the frequency of pest attack, some physiological processes in the plant and grain yield at harvest. The physiological determinations were carried out in the step of forming the grain of sorghum, using the apparatus LCpro + Portable Photosynthesis System. The results were calculated and interpreted in terms of statistical using mathematical and statistical functions and analysis of variance.

RESULTS AND DISCUSSIONS

From observations, it was found that the plant sorghum infestation with green aphid of grain, *Schizaphis graminum* was recorded after 2-3 weeks after emergence, with a frequency of between 7.7-40.6%, according to the treatment plant (Figure 1).

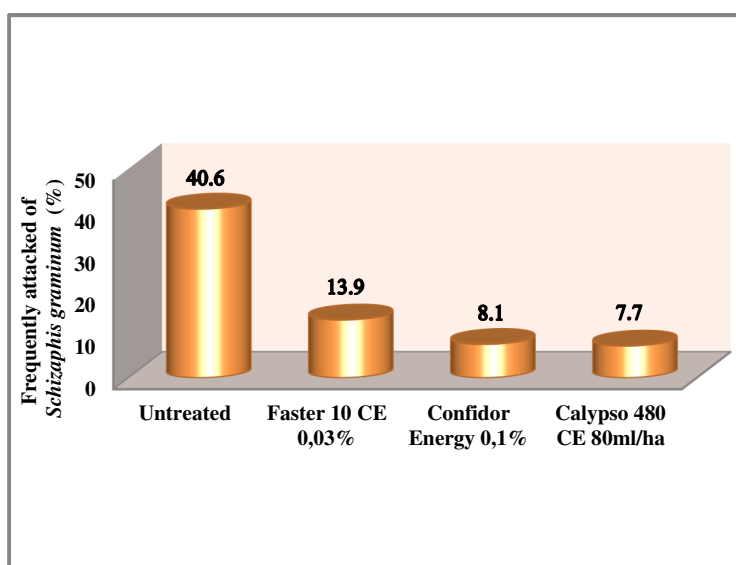


Figure 1. The phytosanitary treatment effect of the frequently attacked of *Schizaphis graminum* to sorghum crop

The results obtained, shows very good the efficacy, of the product Calypso 480 EC, at a dose of 80 ml / ha, in reducing by 81% the frequency of pest attack *S. graminum*, compared to the untreated control, where there was a 40.6% frequency. Determinations at the sorghum on daytime photosynthetic rate developments and active radiation in photosynthesis in the different variants of the pest control protection of the *S. graminum* highlighted the importance plant health in conduct of the intensity (Figure 2).

It is noticed a diurnal variation of physiological processes, in relation to environmental conditions at the surface of leaf apparatus (temperature, atmospheric pressure) and the frequency of pest attack. The rate of CO₂ accumulation in the process of photosynthesis, has

registered a maximum value ($37.85 \mu\text{mol m}^{-2}\text{s}^{-1} \text{CO}_2$) at o'clock 15, in the variant treated with the Calypso 480EC systemic product, at a dose of 80 ml/ha. For accumulate this amount of CO_2 , the sorghum plant loses $4.01 \text{ mmol H}_2\text{O m}^{-2} \text{s}^{-1}$.

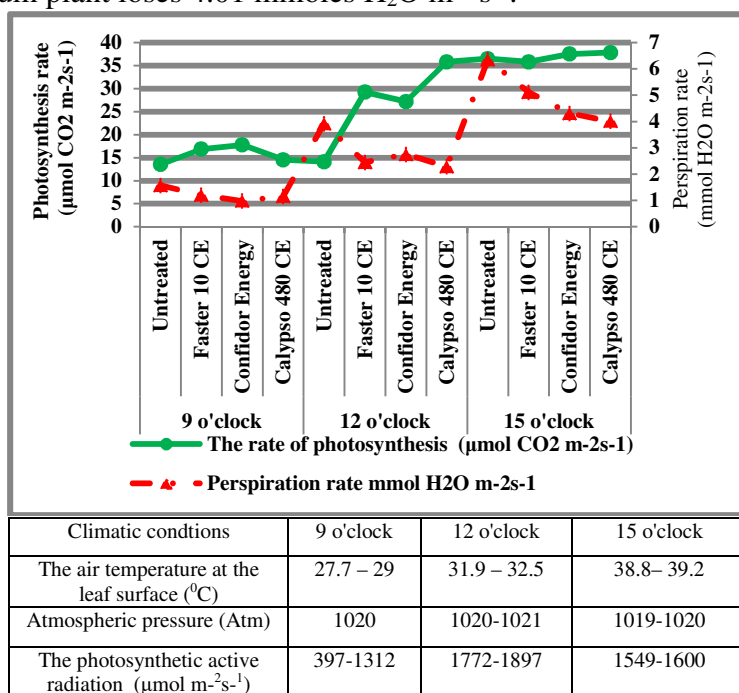


Figure 2. The phytosanitary treatment effect of the sorghum plant's photosynthetic process

Being a drought resistant plant, accentuation of thermal stress from the 15 o'clock, by increasing the temperature of the leaf surface, has not disrupted the photosynthesis process of the plant of sorghum. Analyzing the functional link between the frequency of attack produced by *S. graminum* and leaf chlorophyll content of sorghum, determined at 9 o'clock highlights a significant negative correlation (Figure 3).

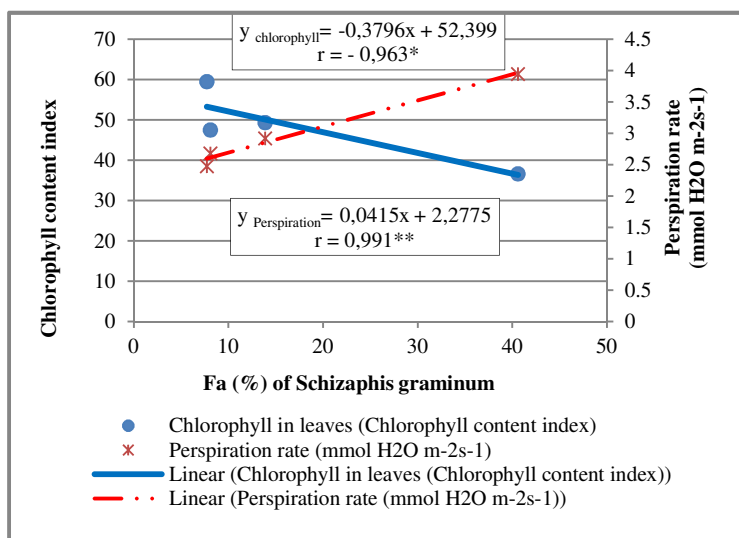


Figure 3. Correlations between the attack frequency of *Schizaphis graminum* and some aspects of the sorghum plant physiology

An optimal control damaging agents has determined and a direct control of the water losses through sweating. Increased the attack frequency of *S. graminum*, led to intensification of perspiration (average daily) of the sorghum plant. Treatment with Calypso 480EC, in a dose of 80 ml/ha led to optimize perspiration ($F\% = 7.73$; $2.48 \text{ mmol H}_2\text{O m}^{-2} \text{ s}^{-1}$). Analysis of the effect of insecticides tested in sorghum grain, highlights a good efficacy of the systemic product Calypso 480CE in combating's *S. graminum* (Table 1). Making of two phytosanitary treatments, in stages 4-5 leaves and 6-8 leaves of the sorghum plant with Calypso 480EC at a dose of 80 ml/ha has led to a maximum of 6614.6 kg/ha, in the production of grains with a very significant difference of 1905.7 kg/ha compared to untreated control.

Table 1. Grain yield obtained in different variants of phytosanitary treatment of sorghum crop

Phytosanitary treatment			Grain yield			
No.	Insecticides	Dose	Kg/ha	%	Difference Kg/ha	Significance
1	Untreated	-	4709	100	Control	Control
2	Faster 10 CE	0.03%	5555.3	118	846.3	*
3	Confidor Energy	0.1%	6163.6	131	1454.6	***
4	Calypso 480 CE	80 ml	6614.6	141	1905.7	***

LSD 5% = 745.3 kg/ha; LSD 1% = 1013.3 kg/ha; LSD 0.1% = 1357.3 kg/ha

The production losses have been positively correlated with the frequency of pest attack *S. graminum* (Figure 4). The results show recording a reduction of 28.8% in production of grains in untreated variant with insecticide.

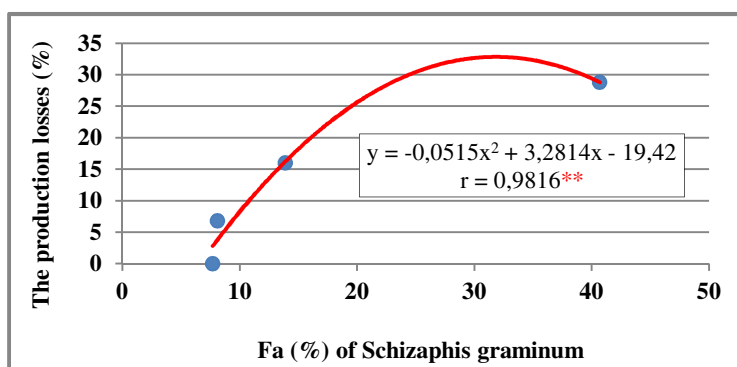


Figure 4. The relationship between the attack frequency of *Schizaphis graminum* and the production losses

CONCLUSIONS

It was highlighted the efficacy very good of the product Calypso 480 EC, at a dose of 80 ml/ha, reducing by 81% the attack frequency of *Schizaphis graminum*, compared to the untreated control, which saw a frequency of 40 6%.

Frequency of attack produced by *S. graminum* on sorghum was negatively correlated with the content of chlorophyll and the positive correlated with the transpiration rate at level of the plant leaf.

Performing of two phytosanitary treatment at sorghum, during the growing season during in phases 4-5 and 6-8 leaves of the sorghum plant, with Calypso 480EC at a dose of 80 ml/ha led to a maximum of 6614.6 kg/ha production obtained, with a difference of 1905.7 kg/ha compared to untreated variant, very significant statistically.

Under conditions psamo-pelitic soils in southern Oltenia, attack of the *S. graminum* has reduced by 28.8% the grain sorghum production, compared with variant treated Calypso 480EC at a dose of 80 ml/ha.

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