

SHORT COMMUNICATION

EFFECT OF MITE DAMAGE ON CHLOROPHYLL CONTENT OF COMMERCIAL SUGARCANE VARIETIES ASSESSED USING SPAD METER

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Abstract

Sugarcane is one of the most important cash crops in several countries and is vulnerable to attack by different mite species. The most economically important species in Iran is *Oligonychus sacchari* McGregor (Acari: Tetranychidae). Under hot weather during summer, this pest colonizes the leaves and the plants dry under heavy infestation. To evaluate mite damage on chlorophyll content of sugarcane, a trial was laid out at Salman Farsi Agro-industry Farms on three commercial sugarcane varieties, namely IRC99-02, CP57-614 and CP48-103 in completely randomized block design with four replications. The chlorophyll content of leaves was assessed indirectly by a SPAD-502 chlorophyll meter in three categories of infestation, namely heavy, medium and no-damage. There were significant differences among the three levels of damage for all three varieties which indicated that mite damage could reduce chlorophyll content. The three varieties showed more or less similar response to the mite damage.

Keywords: Sugarcane, varieties, *Oligonychus sacchari*, chlorophyll content, damage

Globally, about 30 species of spider mites have been recorded attacking sugarcane (including hybrids), its relatives such as wild canes and gramineous weeds (Beard et al. 2003). Sugarcane mite *Oligonychus sacchari* McGregor (Acari: Tetranychidae) is one of the most harmful arthropod pests associated with the crop during summer (Askarianzadeh et al. 2002). Sugarcane mite occurs during late spring to mid-summer when its activity begins in grass weeds from where it shifts to sugarcane crop in the habitat. Affected leaves become discolored and in heavy infestation the whole plant dries up (Fig. 1) (Nikpay and Soleyman Nejadian 2014). Probing by stylets may result in damage to mesophyll cells and this cell injury will lead to chloroplast deterioration and eventual reduction in chlorophyll content (Bueno et al. 2009; Campbell et al. 1990). Since

no published information is available presently on the relationship between *O. sacchari* damage and chlorophyll content in sugarcane varieties, the present study was undertaken using SPAD meter reading as an indirect estimate of chlorophyll content.



Fig. 1. Severe damage of *Oligonychus sacchari* on susceptible sugarcane variety IRC99-02 in summer 2016

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A field experiment was laid out in mid-June 2016 at Salman Farsi Agro-industry Farms (48°35'E, 31°8'S), Ahwaz, Iran. Three sugarcane varieties sensitive to mite damage, namely IRC99-02, CP57-614 and CP48-103 were evaluated in the study in randomized block design with four blocks. All varieties were cultivated as plant crop under standard tillage after complete plough-out of previous ratoon crop, following ridging at 1.8m row spacing throughout the field. Each experimental plot was of 126 m² area and consisted of eight furrows for each level of damage in each variety. Three mite damages levels, namely heavy (>50% leaf area damaged), medium (<50% leaf area damaged) and control no-damage (free from damage) (Fig. 2) were followed to record SPAD meter reading (SPAD 502, Minolta, Japan), which was used as an indirect measure of chlorophyll content. In each block, five leaves were selected randomly for each category and three readings were taken from the top, middle and bottom portions of each selected leaf. All analysis were performed with SPSS software version 16 (SPSS 2007) and means among damage categories were compared with Tukey-Kramer honestly significant difference (HSD) test.

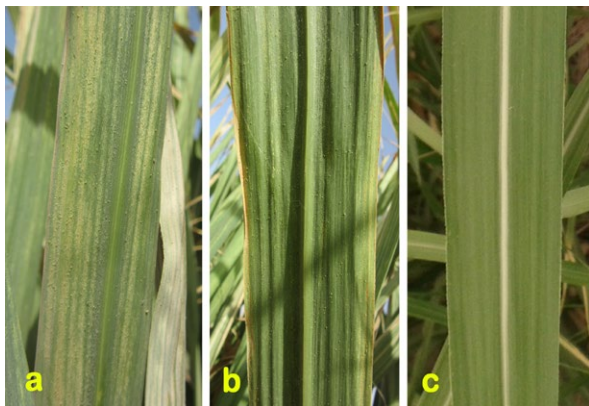


Fig. 2. Damage levels of *Oligonychus sacchari* in sugarcane: (a) heavy (b) medium (c) no-damage (control)

Sugarcane yellow mite infested the three cultivars under natural field conditions confirming the previous results that these varieties are susceptible to mite damage (Nikpay and Soleyman Nejadian 2014). Results of SPAD observations clearly showed that under different levels of damage, mite infestation might significantly reduce chlorophyll content of all three sugarcane varieties (Fig. 3). In variety CP48-103, the mean SPAD meter readings for heavy, medium and no-damage were 27.26±0.36, 33.72±0.37 and 39.72±0.32, respectively. In variety CP57-614, the mean SPAD meter readings for heavy, medium and no-damage were 25.66±0.28, 33.85±0.27 and 40.23±0.36, respectively. In variety IRC99-02, the mean SPAD

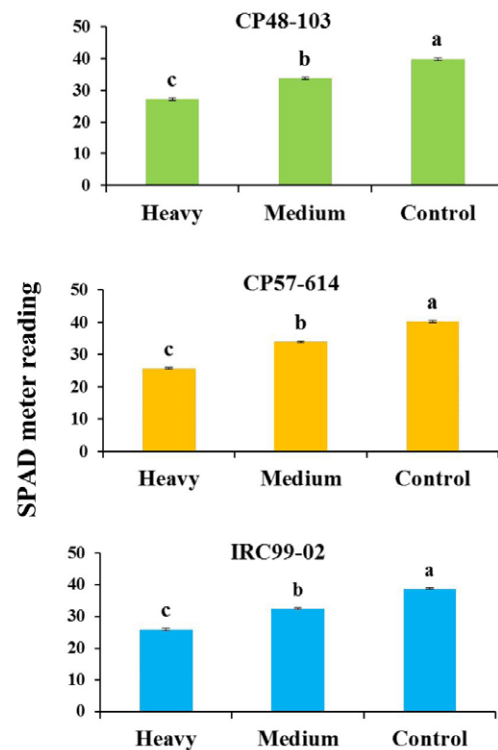


Fig. 3. SPAD meter readings in three sugarcane varieties infested by *Oligonychus sacchari* to different levels of intensity. Means followed by the same letter are not significantly different by Tukey-Kramer HSD test at $P = 0.05$

meter readings for heavy, medium and no-damage were 25.93 ± 0.41 , 32.55 ± 0.26 and 38.88 ± 0.31 , respectively. Although not analyzed, SPAD meter readings showed similar values and identical trend in the three varieties. Various reports indicate reduction in chlorophyll content in conjunction with spider mite damage in different agricultural commodities including cotton (Bondada et al. 1995), soybean (Bueno et al. 2009) and strawberry (Sances et al. 1982). For instance, Bueno et al. (2009) showed that chlorophyll content of soybean leaves was reduced in plants damaged by *Tetranychus urticae* Koch in comparison with control plants. Nuessly et al. (2015) showed that sugarcane rust mite *Abacarus sacchari* Channabasavanna (Acari: Eriophyidae) could reduce the rate of photosynthesis and chlorophyll content, especially in the variety CP89-2143. In Iran, Cheraghi et al. (2016) showed that in the variety SP70-1143, mite infestation in summer reduced greening index. Our results are the first report of the effect of damage due to the genus *Oligonychus* on SPAD meter reading in sugarcane. Further studies are needed to evaluate the effect of mite damage on other plant physiological parameters including photosynthesis, stomatal conductance and level of CO₂ concentration in sugarcane leaves. Although the three varieties showed identical response to the mite damage, large-scale screening of commercial varieties may reveal differential patterns and sources of resistance.

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