Diversity of arthropods in genetically modified br and rr cotton crops in northern Santa Fe, Argentina

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Genetically modified (GM) crops have been widely expanded within the agricultural systems in Argentina. The commercial production of cotton BG / RR was authorized in 2009. The aim of this study was to compare the abundance, richness and diversity of arthropod between genetically modified cotton crops BR and RR. This research work was carried out during three cotton season (2010 until 2012) in the field of Agricultural Experimental Station of INTA Reconquista, Santa Fe (Argentina). A randomized complete block design was used with two GM varieties: NuOpal (BR), lepidoptera and herbicide resistant and G2000 (RR) herbicide resistant with five replications. Arthropods sampling was conducted during season summer, at 30, 60 and 90 days after emergence. Two pitfall traps were placed per plot during 7 days to survey soil stratum and two samples with G-Vac (garden-Vacuum) were used to survey aerial plant. Abundance (Ab), diversity indexes (Shannon H) and richness (r) were estimated using the PAST program. Data was tested by ANOVA and average were compared by Tukey test (α <= 0.05) using InfoStat/P software. A total of 31396 arthropods were captured (pitfall=18382 and G-Vac= 13014). There was not found differences for Ab, r and H indexes between BR and RR for each sampling technics. The only difference found was for H index in pitfall traps among season bein H 2011 (2.0) bigger than 2010 (1.5) (α <= 0.05). According to the results obtained in three cotton season, the abundance, diversity and richness of arthropods present in the crop were not be affected by using varieties with two events (lepidopteran and herbicides resistant) compared with varieties with only one event (herbicide resistant).

Introduction

Genetically modified crops have been widely expanded within the agricultural systems in Argentina in the last few years. The production and marketing of cotton with two biotechnological events (MON 531 x MON 1445) resistant to Lepidoptera and glyphosate was
authorized in Argentina in February 2009 (ArgenBio, 2011). The adoption of cotton BG / RR marks a turning point in the production of cotton and this is the first year of commercial production in our country, it is necessary to obtain information on abundance, richness and diversity of arthropods during three years consecutive with stacked events for the environmental conditions the northern region of Santa Fe.

Objective:

The aim of this study was to compare the abundance, richness and diversity of arthropod between genetically modified cotton crops BR and RR.

Materials and Methods

This research work was carried out during three cotton season (2010-2011-2012) in the field of Agricultural Experimental Station of INTA Reconquista, Santa Fe (Argentina), located at 29° 11' S and 59 ° 52'W. ). A randomized complete block design was used with two GM varieties: NuOpal (BR), lepidoptera and herbicide resistant and G2000 (RR) herbicide resistant with five replications. The plot included 12 rows spaced 0.52 m by 15 m long. Treatments used were two GM varieties: 1) (BR) NuOpal Lepidoptera and herbicide-resistant and 2) G2000 (RR) herbicide resistant. Delinted seed to acid was used, treated with systemic insecticide and fungicide. Sowing was done in late December under conventional tillage (2010-2011) and no tillage (2012). No pesticide application was made after planting; only was applied growth regulator and defoliant. Sampling of arthropods was conducted from season summer 2010 at 2012 (A1, A2 y A3), at 30, 60 and 90 days after emergence. For the survey of soil stratum, 2 pitfall traps with saline solution were placed per plot, separated by 6 m, during 7 days. For the aerial plant samples was used a G-Vac (garden-Vacuum). Two samples of G-Vac for each plot using a STIHL blower. Each sample by suction for one minute represents an area of one square meter. The collected material was preserved in individual containers with 70% ethyl alcohol, properly labeled and taken to the laboratory for further identification. Placed a total of 20 traps and 20 sites were aspirated by sampling date. With individual data for each treatment per replication from pitfall trap and G-Vac were calculated H diversity indexes (Shannon) and r (richness) by using the PAST program. InfoStat/P (Di Rienzo et al, 2010) as statistical software was used to perform variance analysis, data of abundance were ln transformed prior to analyses normalize distributions of variance, and averages were compared with Tukey test ($\alpha <= 0.05$).

Results and conclusion

A total of 31396 arthropods were captured. Using pitfall traps were captured 18382 individuals while 13014 with the G-Vac. No differences were found between treatments for both indexes (r and abundance). Only the diversity index showed differences statistics between 2011 and 2010 for pitfall traps (Table 1).

Table 1. Diversity index by variety and season cotton.

<table>
<thead>
<tr>
<th>Variety / year</th>
<th>Richness (r)</th>
<th>Abundance</th>
<th>Diversity (Shannon_H)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G-Vac pitfall</td>
<td>G-Vac pitfall</td>
<td>G-Vac pitfall</td>
</tr>
<tr>
<td>NuOpal BR</td>
<td>30 A</td>
<td>34 A</td>
<td>833 A</td>
</tr>
<tr>
<td>G2000 RR</td>
<td>30 A</td>
<td>37 A</td>
<td>613 A</td>
</tr>
<tr>
<td>2010</td>
<td>35 a</td>
<td>40 a</td>
<td>1148 a</td>
</tr>
<tr>
<td>2011</td>
<td>29 a</td>
<td>35 a</td>
<td>540 a</td>
</tr>
<tr>
<td>2012</td>
<td>26 a</td>
<td>32 a</td>
<td>481 a</td>
</tr>
<tr>
<td>CV %</td>
<td>21,5</td>
<td>15,9</td>
<td>11,5</td>
</tr>
</tbody>
</table>

Means in each column followed by the same letter are not significantly different ($p<= 0.05$)

The most abundant group captured with pitfall traps were Formicidae (54.4 % RR and 44.0 % BR), Coleoptera (4.3 % RR and 12.5 % BR). Considering de G-Vac sampling the most
abundant were *Aphis gossypii* Glover (17.4 % RR and 48.9 % BR), *Chrysoperla externa* Hagen (8.9 % RR and 3.9 % BR) and spider (7.1 % RR and 9.2 % BR).

According to the results obtained in three cotton season, the diversity and richness of arthropods present in the crop were not affected by using varieties with two events (resistant to lepidopteran and herbicides) compared with varieties with only one event (herbicide resistant).

**References**


Keywords: NuOpal, richness, abundance, G2000