Host suitability of soybean and corn genotypes to the root lesion caused by nematode under natural infestation conditions

Hospedabilidade de genótipos de soja e de milho ao nematoide das lesões radiculares, sob condições naturais de infestação

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ABSTRACT

Among the nematode management strategies, genetic resistance is one of the most appropriate and desirable. However, resistant soybean and corn genotypes resistant to Pratylenchus brachyurus are not available up to the moment. The objective of this study was to evaluate the host suitability of 50 soybean and 38 corn genotypes to P. brachyurus under natural infestation. Soybean genotypes BRSGO Chapadões, BRSGO Paraíso, M-Soy 7211 RR, M-Soy 8008 RR, Emgopa 313 RR, M-Soy 8411, BRSGO Juliana RR, Emgopa 316 RR, BRSGO Luziânia RR and TMG 103 RR, and corn genotype Agromem 30406 reduced the nematode population during the evaluation period.

Key words: Glycine max, Zea mays, Pratylenchus brachyurus, resistance.

RESUMO

Dentre as estratégias de manejo de nematóides, a utilização de resistência é uma das alternativas mais apropriadas e desejáveis. No entanto, até o momento, não se dispõe de genótipos de soja e de milho reconhecidamente resistentes a Pratylenchus brachyurus. O objetivo deste trabalho foi avaliar a reação de 50 genótipos de soja e de milho a P. brachyurus em áreas naturalmente infestadas. Os genótipos de soja BRSGO Chapadões, BRSGO Paraíso, M-Soy 7211 RR, M-Soy 8008 RR, Emgopa 313 RR, M-Soy 8411, BRSGO Juliana RR, Emgopa 316 RR, BRSGO Luziânia RR e TMG 103 RR, e o de milho Agromem 30406 reduziram a população do nematoide ao longo do período de avaliação.

Palavras-chave: Glycine max, Zea mays, Pratylenchus brachyurus, resistência.
induce specialized feeding cell formation makes it difficult to find resistance and to elucidate the mechanisms involved (GOULART, 2008).

In order to evaluate commercial soybean and corn genotypes looking for resistance to *P. brachyurus* two trials were carried out: one with soybeans in Vicentinópolis/GO and the other with corn in Edéia/GO. Both experiments were installed in commercial crops under conventional sowing systems naturally infested by the nematode, with a history of high nematode populations and the occurrence of stunted spots in the previous harvest. The experimental design was a randomized complete block with split plot over time, with 50 treatments (genotypes) and eight replications for soybean and 38 treatments (genotypes) and ten replications for corn. The evaluations were performed at 30 and 60 days after emergence (DAE). Each plot consisted of a 50 cm row, allowing a ten seed condensed sowing. Each row contained all genotypes ordered at random, composing a block.

For each evaluation, samplings were drawn collecting three plants from each plot. The shoots were discarded and the root systems taken to the laboratory for nematode extraction according to methodology described by COOLEN & D’HERD (1972). Nematode density data were subjected to tests for normality and homogeneity of variance. Once the statistic assumptions were complied, the means test (P≤0.05) separated the soybean genotypes into two groups in both evaluations (Table 1). The analysis showed interaction between genotypes and evaluation periods (P≤0.05) for 12 soybean genotypes; ten with population reduction (BRSGO Chapadões, BRSGO Paraiso, M-Soy 7211 RR, M-Soy 8008 RR, Emgopa 313 RR, M-Soy 8411, BRSGO Juliana RR, Emgopa 316, BRSGO Luziania RR and TMG 103 RR), ranging from 46% to 70%. A possible explanation for the decline observed in the nematode population in the second evaluation is that the tested soybean cultivars have determined growth habit that paralyzes their growth after flowering, before entering the reproductive stage (NOGUEIRA et al., 2009). As roots stop growing, there is greater competition for food among nematodes, forcing their output from the plant or reducing their multiplication.

Other authors also tested some soybean genotypes tested in this study and, in some cases, results were confirmed. ALVES et al. (2011) also observed that cultivars ‘Emgopa 313 RR’ and ‘M-Soy 8411’, considered potentially resistant in this study, had low reproduction factor (RF) under controlled conditions. RIBEIRO et al. (2007) and MACHADO (2009) also found similar results for cultivar BRSGO Chapadões under greenhouse conditions. Conversely, ‘TMG 103 RR’ and ‘BRSGO Paraiso’ cultivars, which in the present study were considered resistant, presented high RF in a study by RIBEIRO et al. (2007).

The corn genotypes tested were divided by the mean test (P≤0.05) in three groups, in both evaluations (30 DAE and 60 DAE) (Table 2). From the corn genotypes tested, 16 significantly increased the nematode population density at 60 DAE, most with an increase of over 100%. Similar results were found by LORDELLO et al. (1985), who also observed a gradual increase of nematodes *P. brachyurus* and *P. zeae* during the testing period in a trial in field with evaluations at 39, 59 and 90 DAS. INOMOTO (2011) studied the reaction of corn hybrids to *P. brachyurus* under controlled conditions and observed RF ranging from 4.0 to 15.4.

In this study, only four corn genotypes showed low population density both in evaluations, which can indicate genetic resistance (Table 2). They were P 30F80, GNZ 2500, DKB 350 and NK Impacto. Hybrid Agromem 30A06, despite being among those that showed high population densities in the first evaluation, was the one that had the density reduced by 58% at 60 DAE.

Diverse results reported in different studies for soybean and corn genotypes may be due to differences in the methods used for conducting and evaluating experiments. Extraction and counting of nematodes from roots may still be the most appropriate method to check nematode population density as well as to evaluate crop yield related to the existence of tolerance to *P. brachyurus* under naturally infested field conditions. It is possible that the genotypes that remained with low nematode population density along the evaluation period may present mechanisms to make difficult the nematode penetration. Conversely, genotypes that presented significant reduction on the nematode population at the second evaluation may have some mechanism that works after the nematode has entered the roots. This suggests that new studies should look for mechanical or biochemical modifications in the plants due to the nematode parasitism.

Another hypothesis to explain the diversity of results when compared to other studies, is that
there may be differences of aggressiveness among nematode populations of *P. brachyurus* from different regions of Brazil (FALLAS et al., 1996; MACHADO et al., 2006), suggesting that studies to characterize the behavior of soybean and corn genotypes to this nematode should be sustained.

The genotypes of soybean and corn that remained with the lowest population densities in the behavior of soybean and corn genotypes to this nematode should be sustained.

*Ciência Rural, v.46, n.4, abr, 2016.*
the two evaluation periods or significantly reduced
the population in the second evaluation can be
considered moderately resistant and be good choices
for sowing in areas infested by the nematode. They
can also be targeted for further investigations
identifying genetic resistance.

Table 2 - Population density of *P. brachyurus* (n. of individuals 10g$^{-1}$ of roots) at 30 and 60 days after emergence (DAE) in corn genotypes.
Edéia, GO. UFG, 2009.

| N  | Genotypes | 30 DAE | 60 DAE |
|----|-----------|--------|--------|
| 1  | AG 9040   | 1,497  | a      | 4,248  | a$^*$ |
| 2  | AG 8060   | 1,257  | a      | 3,813  | a$^*$ |
| 3  | P 30F87   | 1,635  | b      | 3,698  | a     |
| 4  | DKB 390YG | 737    | b      | 3,584  | a$^*$ |
| 5  | AG 9010   | 1,253  | b      | 3,064  | a$^*$ |
| 6  | P 30R32   | 906    | b      | 2,965  | a$^*$ |
| 7  | P 30F81   | 1,384  | a      | 2,892  | a     |
| 8  | AG 7088   | 2,400  | a      | 2,653  | a     |
| 9  | NK Somma  | 966    | b      | 2,632  | b     |
| 10 | DKB 177   | 785    | b      | 2,143  | b$^*$ |
| 11 | BM 1115   | 1,172  | b      | 2,094  | b$^*$ |
| 12 | DKB 390   | 797    | b      | 1,962  | b$^*$ |
| 13 | NT Exceler| 279    | c      | 1,921  | b$^*$ |
| 14 | Nidera BX974 | 1,102 | a     | 1,907  | b   |
| 15 | P 30 F 35 | 788    | b      | 1,790  | b$^*$ |
| 16 | P 30K75   | 1,916  | a      | 1,605  | b     |
| 17 | Dow 2B710 | 913    | b      | 1,566  | b     |
| 18 | BRS 1031  | 1,433  | a      | 1,529  | b     |
| 19 | AG 7000   | 886    | b      | 1,529  | b$^*$ |
| 20 | AS 1535   | 1,250  | b      | 1,437  | b     |
| 21 | AG 6040   | 1,042  | b      | 1,412  | b     |
| 22 | Dow 1B287 | 1,083  | a      | 1,385  | b$^*$ |
| 23 | BRS 1010  | 300    | c      | 1,366  | b$^*$ |
| 24 | BRS 1030  | 1,805  | a      | 1,292  | c     |
| 25 | P 30S40   | 917    | b      | 1,287  | c     |
| 26 | DKB 789   | 1,673  | a      | 1,274  | c     |
| 27 | P 30K73   | 1,014  | b      | 1,199  | c     |
| 28 | Dow 2B587 | 1,444  | a      | 1,077  | c     |
| 29 | DKB 330   | 1,731  | a      | 1,003  | c     |
| 30 | P 30 F 80 | 542    | c      | 952    | c     |
| 31 | P 30S31   | 1,130  | b      | 945    | c     |
| 32 | Agromem 30A06 | 2,198 | a   | 926    | c$'$ |
| 33 | AS 1575   | 1,098  | a      | 925    | c     |
| 34 | GNZ 2500  | 327    | c      | 892    | c$'$ |
| 35 | DKB 499   | 945    | b      | 804    | c     |
| 36 | DKB 350   | 176    | c      | 758    | c$'$ |
| 37 | DG 501    | 591    | b      | 733    | c     |
| 38 | NK Impacto| 287    | c      | 539    | c$'$ |

CV% 4.76

Means followed by the same letter do not differ by the Scott-Knott test at the 5% level of significance. For the analysis of variance data were transformed into $y' = y^{0.057}$.

*Significant interaction between evaluation periods at 5%.

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