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GEOGRAPHIC DISTRIBUTION OF *Lolium multiflorum* Lam. RESISTENT TO CLETHODIM HERBICIDE IN SOUTHERN BRAZIL

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RESUMO

O azevém é uma planta daninha ocorrente em lavouras de inverno, em pomares e vinhedos da região Sul do Brasil. A espécie normalmente é controlada pelo herbicida glyphosate, no entanto, o uso continuado desse produto selecionou biótipos resistentes. O controle com herbicidas inibidores da ACCase é a principal alternativa para o controle dessa espécie, o qual não tem sido satisfatório em alguns locais provocando a suspeita da ocorrência de resistência a herbicidas com este mecanismo de ação. Sendo assim, o objetivo deste trabalho foi avaliar a ocorrência e distribuição geográfica de biótipos de azevém resistente ao herbicida clethodim. Para isso, sementes de plantas de azevém que sobreviveram a aplicações de clethodim foram coletadas em lavouras da região norte do RS, totalizando 152 amostras de 72 municípios. Os biótipos foram submetidos ao tratamento de 120g i.a. ha⁻¹ de clethodim (dose máxima de registro) e 60g i.a. ha⁻¹ (metade da máxima dose de registro). De acordo com os resultados, não há biótipos de azevém resistentes ao herbicida clethodim quando aplicado a máxima dose de registro e estágio recomendado, no entanto, há biótipos com menor suscetibilidade que sobreviveram a metade da máxima dose de registro.

Palavras-chave: azevém, controle químico, resistência.

ABSTRACT

The ryegrass is a weed occurring in winter fields, orchards and vineyards in southern Brazil. The specie normally is controlled with glyphosate, however, the continued use selected resistant biotypes. The control with herbicides ACCase inhibitors is the main alternative to control this specie, which has been not satisfactory in some fields causing the suspect of resistance occurrence to herbicides with this mechanism of action. Therefore, the objective of this work was evaluate the occurrence and geographic distribution of ryegrass biotypes resistant to clethodim herbicide. For this, seeds of ryegrass plants that survived to clethodim application were collected in fields of north region of RS, totaling 152 samples of 72 cities. The biotypes were submitted to application of 120g a.i ha⁻¹ of clethodim (maximum dose registration) and 60g a.i ha⁻¹ (half the maximum dose registration). According to results, there are not ryegrass biotypes resistant to clethodim herbicide when applied maximum dose registration and recommended stage, however, there are with less susceptibility that survived to half the maximum dose registration.

Keywords: ryegrass, chemical control, resistance.

INTRODUCTION

In tillage or orchards, control of ryegrass is usually accomplished by applying non-selective herbicides, glyphosate being the most popular. The intensive use of an herbicide impose high selection pressure on the population of plants resulting in the selection of pre-existing resistant biotypes in the population [1]. Thus, repeated use of glyphosate resistant ryegrass selected biotypes to this herbicide [2]. Alternatively ryegrass control populations resistant to glyphosate, particularly in pre-planting of maize and wheat, the ACCase inhibiting herbicides enzyme are used, being clethodim the most used.

Faced with a scenario of increased occurrence of cases of resistance of weeds to herbicides, measures providing for resistance management are essential, and the constant monitoring of the field for the identification of sites of resistance and disposal of suspect plants are important [3].

The knowledge of resistant species and extent of the infested area provides knowledge of the seriousness of the problem and to determine the resistance management and make the selection process more slowly resistant biotypes, assisting in making reactive decisions in controlling these populations [4]. In addition, resistance mapping allows you to establish the costs of resistance, the definition of public policies and targeted technical assistance.

Hypothesizes of this work is that there ryegrass biotypes resistant to the herbicide clethodim in the Rio Grande do Sul state and the objective was to evaluate the geographical distribution of resistant ryegrass biotypes this in the Rio Grande do Sul state.

MATERIAL AND METHODS

For the accomplishment of work, ryegrass plant seeds were collected that survived the application of ACCase-inhibiting herbicides on fields in the northern region of Rio Grande do Sul State. The seed samples were composed from a plant and all sampling points were identified by geodetic coordinates, using the *Global Positioning System* (GPS). The collection of seeds occurred among September and November 2013, in farms located in 74 cities totaling 152 samples of seeds.

To check the occurrence of resistance, an experiment was conducted from October to December 2013 in the Green house at Embrapa Wheat in Passo Fundo-RS. The design was completely randomized and the treatments arranged in a factorial design, where factor A consisted of biotypes of different collection sites and factor B consisted of two of clethodim herbicide doses, 60 and 120g i.a. ha⁻¹, representing half the maximum registration dose and the maximum dose registration, respectively, for ryegrass control in pre-planting corn and wheat. Was added also a control treatment without herbicide application. The experimental units consisted of plastic pots, with volumetric capacity of 500mL, containing commercial substrate, being composed of five plants per vase⁻¹.

After the plants had the four leaf to a tiller, the herbicide was applied using a backpack sprayer, a CO2 pressurized calibrated to provide application volume of 120L ha⁻¹ of herbicide spray. It was used additionally in the spray the adjuvant Lanza® at a dose of 0,5% v/v.

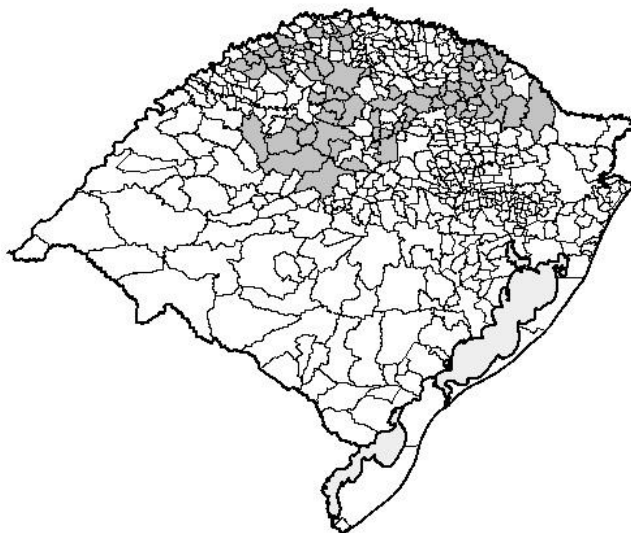


Figure 1 – Geographical location of the cities where it was held collection ryegrass plant seeds with suspected resistance to the herbicide clethodim in Rio Grande do Sul state. Adapted from Geolivre - Thematic Maps RS 2011.

The variable evaluated was visual control at 28 days after herbicide application (DAHA), being identified biotypes according to the response to herbicides as susceptible or resistant, adopting binary scale where zero (0) representing plant death and (1) survival. Data were analyzed using descriptive statistics, seeking to establish relationships between the distribution of cases of ryegrass with suspected resistance to the ACCase enzyme inhibitors.

RESULTS AND DISCUSSION

The data analysis showed that all 152 biotypes were controlled with the dose of 120g a.i. ha⁻¹ of clethodim, evidencing the non-occurrence of resistance to this herbicide. However, 14 biotypes survived to application of half maximum dose register (60 g a.i. ha⁻¹) to ryegrass control, showing sensitivity difference. Similar results were noted in studies of sensibility of *Euphorbia heterophylla* and *Eleusine* spp. biotypes suspected of resistance to glyphosate herbicide, from Roundup Ready soybean fields of RS [5,6].

All 14 survived biotypes from half maximum dose register application showed difference of susceptibility to clethodim herbicide, being concentrates in 12 cities of Northwest, Northeast and Midwest regions, located in Água Santa (2), Coqueiros do Sul (2), David Canabarro, Erval Seco, Espumoso, Ibiraiaras, Panambi, Pejuçara, Santo Cristo, Taquaruçu do Sul, Tenente Portela and Vila Lângaro (Fig. 2).

Thus, according to the results is rejected the hypothesis of the occurrence of *Lolium multiflorum* resistance to clethodim, however, one cannot rule out the occurrence of the susceptibility differences. However, it is worth highlighting the importance of the management of ryegrass, especially with the use of integrated weed management, based on the implementation of crop rotation, rotation and/or association of herbicides with different mechanism of action in order to delay the onset and evolution of biotypes resistant to herbicides. In general, two mechanisms confer resistance to ACCase inhibitors herbicides. Target-site resistance can occur by gene point mutations resulting in amino acid changes in a target enzyme, which prevents or reduces herbicide binding. Non-target-site resistance can be conferred by enhanced activities of metabolic enzymes, reducing the amount of a herbicide reaching the target-site below the lethal level, and/or protecting plantas from herbicide damage [7]. The most common is target site resistance already reported in many species from Poaceae family including *Lolium* spp. [8].



Figure 2 – Geographic location of the cities where there biotypes with less susceptibility to clethodim herbicide in Rio Grande do Sul state. Adapted from Geolivres - Thematic Maps RS 2011

2.4 Conclusions

There are not ryegrass biotypes resistant to clethodim herbicide in Rio Grande do Sul state.

There are biotypes with less susceptibility, not being controlled with half maximum dose register applications of clethodim to control ryegrass.

REFERENCE

- [1]. Annual Review Plant Biology (2010), 61, p. 317-347.
- [2]. Planta Daninha (2004), 22, p.301-306.
- [3]. Ciência Rural (2008), 38, p.852-860.
- [4]. Weed Research (2014), 54, p.314-324.

- [5]. Pesquisa Agropecuária Brasileira (2013), 48, p.17-24.
- [6]. Planta Daninha (2013), 31, p.427-432.
- [7]. Weed Science (2005), 53, p.728-746.
- [8]. Weed Science (1999), 47, p.258-261.