Pattern of ACCase mutations in herbicide-resistant Italian ryegrass populations

Ana Claudia Langaro[1], Gulab Rangani[2], Marlon Ouriques Bastiani[3], Reiofeli Algodon Salas-Perez[4], Antonio Alberto da Silva[5], Nilda Roma Burgos[6]

Universidade Federal de Viçosa[1], University of Arkansas[2], Universidade Federal de Pelotas[3], University of Arkansas[4], Universidade Federal de Viçosa[5], University of Arkansas[6]

The ACCase enzyme is inhibited by aryloxyphenoxypropionate-, cyclohexanedione- and phenylpyrazolin herbicides. These herbicides bind at the CT domain of the plastidic ACCase in grasses. Several mutations in the CT domain confer insensitivity to selective grass herbicides. This study aimed to determine the pattern of ACCase mutations in Italian ryegrass (*Lolium perenne* ssp. *multiflorum)* populations from the southern United States. Five populations were investigated from Georgia, North Carolina, Louisiana, and Arkansas (Woodruff and White Counties). Diclofop and pinoxaden were used to select resistant plants at 2X field rate. The CT domain of the plastidic *ACCase* gene of Italian ryegrass plants was sequenced. All sequences were compared to two susceptible Italian ryegrass standards from Arkansas. Of 100 plants tested, 91% were resistant to diclofop and 67% of diclofop-resistant plants were cross-resistant to both herbicides. The most predominant mutation was the substitution of isoleucine with asparagine in codon 2041 (numbering based on *Alopecurus myosuroides*). This mutation occurred in 40% of resistant plants. Only plants from Louisiana did not contain this mutation. Other known resistance-conferring mutations found in the ACCase of R plants include: $I_{1781}L$ (12%), $D_{2078}G$ (12%), and $C_{2088}R$ (4%). Collectively, TSR accounted for 68% of resistance mechanism in Italian ryegrass. Therefore, widespread resistance to diclofop and pinoxaden among Italian ryegrass in the southern US is generally due to target-site mutations, especially $I_{2041}N$. This does not account for about 32% of R plants; thus, NTSR mechanisms may be involved.

Palavras-chave: herbicide, *Lolium perenne* spp*. multiflorum*, resistance, sequencing

Apoio: Universidade Federal de Viçosa and University of Arkansas