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干旱及复水条件下草甘膦对抗草甘膦大豆幼苗渗透调节物质和莽草酸含量的影响

原向阳¹, 郭平毅¹, 张丽光¹, 王鑫^{1,2}, 祁祥¹, 邵冬红¹

1. 山西农业大学农学院, 作物化学调控与化学除草实验室, 山西 太谷 030801;
2. 太原市星火技术发展中心, 山西 太原 030009

摘要: 为探明干旱胁迫及复水条件下不同剂量草甘膦对抗草甘膦大豆(RR1)幼苗叶片渗透调节物质、莽草酸(shikimic acid, SA)含量及根系活力的影响,采用盆栽试验,在大豆的第3复叶期进行水分胁迫5d和除草剂草甘膦处理,研究RR1幼苗叶片可溶性蛋白(soluble protein, SP)、可溶性糖(soluble sugar, SS)、游离脯氨酸(free proline, FP)、莽草酸(shikimic acid, SA)含量和根系活力(RA)的变化。结果表明,干旱胁迫前期RR1叶片的SP含量随草甘膦剂量的增加呈先升高后降低趋势,0.46kg/hm²叶片SP的含量最高,胁迫后期SP含量随草甘膦剂量的增加而降低;SS、FP和SA含量随草甘膦剂量的增加和胁迫时间的延长而增加,RA随草甘膦剂量的增加和胁迫时间的延长而降低。复水12d后,不同剂量草甘膦处理的各指标均有所恢复。干旱条件下,经草甘膦处理的RR1叶片的SP含量和RA低于草甘膦在正常水分条件下的处理,而SS、FP和SA含量相反。相关性分析表明,FP和SA含量与草甘膦剂量的相关关系最明显;而SS和SA含量与干旱胁迫时间的相关关系最明显。说明正常水分条件下,草甘膦对RR1幼苗造成的伤害经过一段时间后有所缓解;干旱胁迫加剧了草甘膦对RR1幼苗叶片渗透调节物质、莽草酸含量和根系活力的影响。抗草甘膦大豆主要通过积累FP、SS和SA对草甘膦和干旱胁迫做出响应。

关键词: 干旱 草甘膦 抗草甘膦大豆 渗透调节物质 莽草酸

EFFECTS OF GLYPHOSATE AND POST-DROUGHT REWATERING ON OSMOLYTES AND SHIKIMIC ACID CONTENT IN LEAVES OF GLYPHOSATE-RESISTANT SOYBEAN [*Glycine max* (L.) Merr.] SEEDLINGS

YUAN Xiang-yang¹, GUO Ping-yi¹, ZHANG Li-guang¹, WANG Xin^{1,2}, QI Xiang¹, SHAO Dong-hong¹

1. Laboratory of Crop Chemical Regulation and Chemical Weed Control, Agronomy College, Shanxi Agricultural University, Taigu, Shanxi 030801;
2. Taiyuan Spark Technology Development Center, Taiyuan, Shanxi 030009

Abstract: In this study, a pot experiment was conducted to explore glyphosate and post-drought rewatering on osmotic adjusting substances, shikimic acid content and root activity in leaves of glyphosate-resistant soybean seedlings (RR1) and analyze soluble sugar (SS), soluble protein (SP), free proline (FP), shikimic acid (SA) content, and root activity of RR1 under water stress (soil absolute water content is 25%) and glyphosate treatments (0, 0.46, 0.92 (recommended dosage), 1.84 and 3.68 kg/hm²) were conducted at three-trifoliolate leaf stage. Results showed that, during the early period of drought condition, SP content of RR1 increased first, then reduced with increasing of glyphosate dosage, and was the highest at treatment of 0.46 kg/hm². At the later period of drought treatment, SP content decreased with increasing of glyphosate dosage. While, SS, FP and SA content increased with increasing of glyphosate dosage and prolonged drought stress time. Moreover, stress of glyphosate and drought stress decreased the root activity of RR1. The variation of all these indexes in drought condition was more obvious than which in normal water condition. About 17 days later in normal water condition and 12 days after rewatering, contents of SS, SP, FP, SA and root activity of RR1 recovered to some extent. FP and SA contents were correlated with glyphosate dosage most obviously; while drought stress time had the most obvious relationship with SS and SA content. Finally, in normal water condition, the injury of RR1 caused by glyphosate could be eased relieved through a period of growth and development. Drought stress aggravated the influence of glyphosate on RR1 leaf osmotic adjusting substances, shikimic acid content and root activity. Glyphosate-resistant soybean seedlings responded to glyphosate and drought stress mainly through the accumulation of FP, SS and SA in plant.

Keywords: drought glyphosate glyphosate-resistant soybean osmolyte shikimic acid

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通讯作者: 郭平毅(1956-),男,山西寿阳人,博士,教授,研究方向为作物化学调控与化学除草。

Tel: 0354-6286938; E-mail: pyguo126@126.com

作者简介:

作者Email: pyguo126@126.com

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