DISSIPATION OF BISPYRIBAC-SODIUM IN SOIL, WATER AND SEDIMENT OF FLOODED RICE FIELD

MATOS M. L. T.; ANDRES A.; ALMEIDA, M. T.; FACIO, M. L.; SILVA, M. F.
Embrapa Temperate Agriculture, Pelotas, RS, Brazil
maria.laura@cpact.embrapa.br

Introduction

Bispyribac-sodium [sodium 2,6-bis(4,6-dimethoxy-2-pyrimidinyl)-2,6-dioxobenzonitrile] is a selective herbicide of the group of pyridinedionebenzoates, employed in commercial formulation for the post-emergent control of weeds in the culture of irrigated rice in the State of Rio Grande do Sul (RS), Brazil. The herbicide is highly toxic and hazardous for the environment, with security interval of 118 days (ANVISA, 2011). It is highly mobile, diffusing easily in the soil, resulting in possible contamination of groundwater and surface water in surrounding areas. Application of this herbicide in flooded rice crops can result in its accumulation in the soil and sediments, from where it can reach irrigation water supplies (BRASIL, 2011). The bispyribac-sodium herbicide is relatively flexible with regards to utilized dosage and application timing. With increasing dosages, control over weeds in more advanced stages of development is achieved. This characteristic has stimulated some producers to abuse the dosage of the product, leading to the risk of contamination of soils and hydraulic systems.

The objective of this work was to evaluate the residence time of bispyribac-sodium in soil, water, and sediments, in experimental plots, by determining its dissipation in rice paddy field lowland subtropical.

Material and Methods

The study, with duration of two harvest years, beginning in the harvest period 2008/09, was conducted in the Lowlands Experimental Station (ETB) of Embrapa Temperate Agriculture, in Capão do Leão, RS. The soil of the experimental area, a Typic Albaqualf, presented the following characteristics: clay (13%); pH (4.8); organic matter (1.4%); phosphorous (14.7 mg dm⁻³); potassium (71 mg dm⁻³). The treatments comprised (T1) application of 48 g of active ingredient bispyribac-sodium, and (T2) control (without application of bispyribac-sodium). Seeding (cultivar BRS Quênia) was performed on 31/10/2009. The bispyribac-sodium was applied post-emergence of weeds on 04/04/2009, by means of coastal sprayer with fan lip. Irrigation of the plots occurred five days after application of the herbicide (09/12/2009), establishing a water film 0.10 m depth. Qualitative and quantitative analyses were conducted in search of residual bispyribac-sodium from samples of soil, water, and sediment, during the 2009/10 harvest season. Five composite soil samples from the plots were collected, at depths of 0-20 and 20-40 cm, 500 g in mass each, 1 day before application of the herbicide (10DA) and after application, 1DAA, 3DAA and 210DAA. After irrigation, water samples (1 L each) and sediment samples were collected, in triplicate, at depth of 0-20 cm, 1 day after irrigation (1DIAI), 3DAA, 7DAA, 15DAA, 30 DAI, 60 DAI and 90DAA. During the period of drainage of the plots (90DAI), at the outlet of the piping, samples of water were collected at variable intervals, at 30, 60 and 90 minutes after start of drainage. In this period, water samples from the main and the secondary drainage canals were also collected. Chromatographic analyses were conducted at the Laboratory Bioassay Analysis and Environmental Consultancy Ltda., in Porto Alegre, RS, in a high performance liquid chromatograph (HPLC) coupled to a mass spectrometer (LC-MS/MS), model Applied Biosystems 3200 Qtrap.

Results and Discussion

The residual concentration of bispyribac-sodium in the soil at 300DAA during harvest period 2008/09 was 2.3 µg L⁻¹, confirming the characteristic persistence of this molecule in the soil (BRASIL, 2011). The concentration values of the herbicide detected in the soil at 1DAA, 3DAA and 210DAA, at 0-20 cm depth, were 176.6, 129.4 and 30.5 µg L⁻¹, respectively (Figure 1). The results demonstrate that the herbicide is resistant to degradation, remaining in the soil long after its application. This fact can lead to phytotoxicity of sensitive cultures seeded

![Figure 1: Bispyribac-sodium concentration over time in soil, water and sediment.](Image 438x432 to 510x486)

Conclusion

The herbicide bispyribac-sodium remained cumulative in Typic Albaqualf after successive application during two years of irrigated rice culture. Residual amounts were dissipated in irrigation water by 99.72% and in the sediment by 97.1% over 90 days after application. Waters that make up the rice irrigation water film should not be sent to hydraulic systems for a period of 30 days post-application of the herbicide.

REFERENCES

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