REDUCTION OF FIPRONIL DOSAGE FOR BRAZILIAN RICE WATER WEEVIL CONTROL

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Introduction

The Brazilian rice water weevil (RWW) is the larval vulgar name of *Oryzophagus oryzae* (Costa Lima) (Coleoptera: Curculionidae) which is the most important insect-pest in Southern Brazil flooded rice fields. These larvae, if not appropriately controlled, can reduce the rice yield up to 18%.

Despite the contribution of certain agricultural practices adopted in flooded rice to the reduction of *O. oryzae* larval population, the seed treatment with insecticides is the predominant control method in the State of Rio Grande do Sul (RS), which is the main rice producer in Brazil (> 1 million ha). The insecticide fipronil, of the pirazol chemical group, in suspension concentrate (SC) formulation, is the most commonly pesticide used to RWW control, with registration in the Ministry of Agriculture, Livestock and Food Supply (MAPA) in the dosage range of 30 to 37,5 g/100 kg of seeds. In the United States of America, the fipronil has been used to control of *Lissorhoptrus oryzophilus* Kuschel, 1952 (Coleoptera: Curculionidae), in the dosage range of 28 g to 34 g/100 kg of seeds.

The fipronil, despite being highly efficient in the control of *O. oryzae* and *L. oryzophilus*, via seed treatment, presents high risk of toxicity to some aquatic invertebrates, being especially toxic to shrimps, shellfish and oysters. In Brazil, although fipronil residue has been detected in irrigation water and the soil of rice fields, rivers, and irrigation and drainage systems adjacent to rice fields, none information is available about the hazardous effects of this insecticide on the associated aquatic organisms.

One of the strategies to minimize the risk of environmental contaminations due to fipronil use in rice seed treatment and to increase crop profitability consist in the reduction of currently registered dosages for RWW control.

In this sense, during 12 years of research (1995 to 2007) the dosage of fipronil applied to rice seeds has already been reduced by 60% (from 75 g to 30 g/100 kg of seeds), maintaining an average control efficiency greater than 98% (Figure 1).

Objective

The objective of this abstract is show the results of three experimental trials where it was evaluated the effect of the reduction of fipronil dosage (from 10 to 50 g/100 kg of seeds) for RWW control.

Materials and Methods

The trials were conducted between 2004 and 2009, at Embrapa Temperate Climate Research Center, in the county of Capão do Leão, RS Brazil, using a randomized block design, with four repetitions. The experimental plots (2m x 5m) were separated by levees, to avoid the mixing of the chemical treatments. In each plot of the trials, four soil samples (8,5 cm depth by 10 cm diameter) were collected for larval counting, in two periods, between 20 and 40 days after rice flooding. The results of the experiments (Table 1) indicate that the dosage of 10 g/100 kg of seeds is highly efficient for RWW control.

In the 2009/2010 crop season, in a flooded rice area (10 ha), in the county of Arroio Grande, RS, Brazil, a mixture of 1/3 of fipronil treated seeds (dosage= 30 g/100 kg) with 2/3 of untreated seeds, which is equivalent to a dosage of 10 g/100 kg of seeds, was evaluated. The mixture was realized just before the seeding, in the distribution box of the seeding machine. The result (Table 2) was high control efficiency, identical to that of using the "full dosage" of 30 g/100 kg of seeds.

Results

The combined analysis of the experimental results (Table 1) and the validation trial in the rice cultivation area (Table 2) indicate that it is possible to reduce by 67% (from 30 g to 10 g per 100 kg of seeds) the minimum registered fipronil dosage in Brazil for control of RWW via seed treatment (Figure 1). The dosage of 10 g/100 kg of seeds, besides achieving an average control efficiency of 99%, is compatible with greater profitability of the crop and lower environmental contamination risk. When the seeds to be utilized are already treated with fipronil, at the dosage of 30 g/100 kg of seeds, the alternative to achieve a lower fipronil dosage in rice field, of approximately 10 g/100 kg of seeds, consists of pre mix seeds in a mixer, or alternating layers of treated seeds (1/3) with untreated seeds (2/3) in the seeding machine box.

Table 1. Effect of fipronil insecticide dosages applied to rice seeds in the RWW control in experimental plots. Embrapa Temperate Climate Research Center. Capão do Leão, RS, Brazil.

Treatments and dosages	1st evaluation[1]		2nd evaluation[1]	
(g/100 kg of seeds)	NL[2]	EC[2]	NL	EC
Fipronil 00 (control)	15,3	-	18,2	-
Fipronil 10	0,2	98,7	0,2	98,9
Fipronil 20	0,1	99,3	0,2	98,9
Fipronil 30	0,3	98,0	0,4	97,8
Fipronil 40	0,1	99,3	0	100
Fipronil 50	0	100	0	100

[1]Approximately 20 and 40 days after flooding, respectively. [2]Average of number of larvae per sample (NL) and control efficiency (EC) obtained from the three experiments.

Table 2. Effect of a mixture of fipronil treated and fipronil untreated rice seeds on the RWW control in a rice cultivation area. Arroio Grande, RS, Brazil.

Treatments and dosages	1st evaluation[1]		2nd evaluation[1]	
(g/100 kg of seeds)	NL[3]	EC[3]	NL	EC
Fipronil 00 (control)	15,3	-	16,8	-
Fipronil 10 (mix of seeds)[2]	0,1	99	0,1	99
Fipronil 30 ("full dosage")	0	100	0	100

[1]Approximately 25 and 40 days after flooding, respectively. [2]Mixture of 1/3 treated seeds (30 g/100 kg) + 2/3 untreated seeds (equivalent to 10 g/100 kg dosage). [3]Number of larvae/sample (NL) and control efficiency (EC) obtained in a single validation.

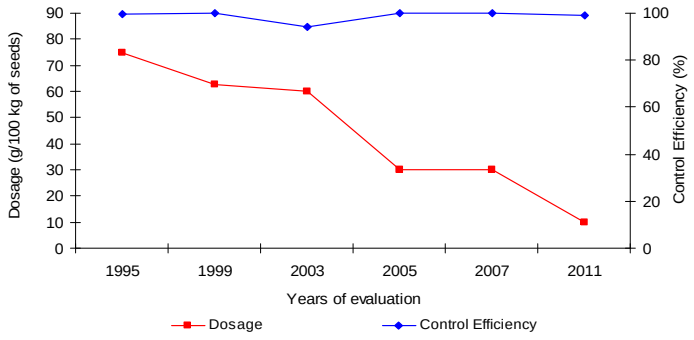

Figure 1. Relationship between dosages of fipronil tested in the treatment of rice seeds and RWW control efficiency, in experimental plots, in a period of 12 years. Embrapa Temperate Climate Research Center. Pelotas, RS, Brazil.

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