

Biological Effectiveness of Using Insecticides (Regent-800, Actara, Confidor) against Colorado Potato Beetle under Conditions of the Rostov Oblast

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Received August 12, 2009

Abstract—Compared with insecticides Actara and Confidor, Regent-800 demonstrated the greatest effectiveness against the Colorado potato beetle.

Key words: potato, Colorado beetle, insecticides, biological effectiveness

DOI: 10.3103/S1068367410020102

In the Rostov oblast the Colorado beetle causes substantial harm to potatoes: its numbers ranges from 6–8 to 15 beetles/plant. Such a considerable number of pests is due to the high prolificacy of females and possibility of the development of three generations. Furthermore, the main growing areas in the region (more than 90%) are concentrated in the private sector; therefore, protective measures are carried out irregularly, with violation of treatment technology, and potatoes are almost completely destroyed [1]. In recent years, preparations with other mechanisms of toxic action (Regent, Actara, Confidor, etc.) have joined the list of agents protecting plants from the Colorado beetle in place of organochlorine and organophosphorus preparations and pyrethroid insecticides (Decis, Karate, Sherpa, etc.) [2, 3].

The purpose of the present investigations was to reveal the effectiveness of present-day agents against this pest under conditions of the Rostov oblast.

METHOD

During 2004–2008 we tested new preparations: Actara (water-dispersible granules, WG), active ingredient thiamethoxam (250 g/kg), a second-generation neonicotinoid; Confidor (emulsion concentrate, EC), an insecticide of the chloronicotinoid class (a preparation of the neonicotinoid group), active ingredient imidacloprid (200 g/l); and Regent-800 (WG), active ingredient fipronil (800 g/kg).

The experiments were conducted in the territory of the Don Zonal Agricultural Research Institute (DZNIISKh) and on a household plot in the vicinity of Rostov-on-Don city from April (potato planting on 26–29) through September in threefold replication on

100-m² plots. The plants were treated with pesticides against Colorado beetle during the appearance of first- and second-instar larvae (end of budding) with a knapsack sprayer at a spray rate of the working solution of 10 l/100 m².

The biological effectiveness and duration of the protective action of the tested pesticides against the pest (reduction of its numbers and degree of their damage to the potato tops) were established by comparing the results of recording these indices before treatment and 3, 7, 14, 21, and 30 days after it by the method of the All-Russian Potato Husbandry Research Institute [4]. During all recording times (30 days) the number of damaged plants and degree of eating the top by the pest were determined by visual examination of the record plants of each variants according to a 5-score scale.

RESULTS AND DISCUSSION

Before treatment, Colorado beetle colonization of potatoes according to variants (Regent-800, Actara, and Confidor) was respectively 23.4, 23.7, and 26.3 individuals/plant, including egg clutches 1.6, 1.4, and 1.8; larvae 20.6, 20.8, and 20.4, and imagoes 1.2, 1.5, and 1.4. Mainly first- and second-instar larvae predominated. Each clutch had 12–40 (in some, up to 73) eggs. In all variants the leaf surface was damaged in 5–15% of the plants. After the first treatment with the preparations we recorded live egg clutches, larvae of all instars, and mature beetles (imagoes) after a certain number of days (in accordance with the method) in each variant.

Regent-800 showed high effectiveness: 100% mortality of larvae of all instars, egg clutches, and mature

Table 1. Biological effectiveness of insecticides on average during 2004–2008

Index			Regent-800	Actara	Confidor	
Number of live individuals/plant after treatment after	3 days	Clutches	0	0	0.1	
		Larvae	0	0	0	
		Imagoes	0	0	0	
	7 days	Clutches	0	0	0.5	
		Larvae	0	0	0	
		Imagoes	0	0	0.3	
	14 days	Clutches	0	0	0.9	
		Larvae	0	0.1	2.7	
		Imagoes	0	0	0.9	
	30 days	Clutches	0	0	0.8	
		Larvae	0	0	18.0	
		Imagoes	0.3	0.6	0.9	
	Biological effectiveness (%) after	3 days	Clutches	100	100	94.4
			Larvae	100	100	100
			Imagoes	100	100	100
7 days		Clutches	100	100	72.2	
		Larvae	100	100	100	
		Imagoes	100	100	78.5	
14 days		Clutches	100	100	50.0	
		Larvae	100	100	86.8	
		Imagoes	100	100	35.7	
30 days	Clutches	100	100	55.0		
	Larvae	100	100	11.8		
	Imagoes	75.0	60.0	35.7		

Table 2. Colorado potato beetle damage to plants on average during 2004–2008

Recording time	Degree of eating of potato leaf surface by beetles according to a 5-score scale	Variant		
		Regent-800	Actara	Confidor
Before treatment	<5	39.8	39.8	39.8
	5–25	36.0	36.0	36.0
	25–50	18.1	18.1	18.1
	50–75	6.1	6.1	6.1
3 days after first treatment	>75	0	0	0
	<5	43.7	43.5	37.6
	5–25	37.2	37.3	37.4
	25–50	17.0	17.1	17.0
7 days after first treatment	50–75	2.1	2.1	5.2
	>75	0	0	2.4
	<5	48.5	47.8	44.7
	5–25	36.0	35.7	35.2
14 days after first treatment	25–50	14.2	14.8	15.1
	50–75	1.3	1.7	3.4
	>75	0	0	2.4
	<5	50.9	49.7	48.4
30 days after first and 14 days after second treatment	5–25	37.8	37.9	37.0
	25–50	11.3	12.4	10.0
	50–75	0	0	2.4
	>75	0	0	1.3
30 days after second treatment	<5	96.3	95.7	63.6
	5–25	3.7	4.3	13.8
	25–50	0	0	10.0
	50–75	0	0	10.6
	>75	0	0	2.0

beetles lasted 30 days (Table 1). A high biological effectiveness of the preparation Actara was noted for 14 days, thereafter a second treatment was necessary, and then the pest numbers were kept below the threshold of harmfulness until the end of potato growth.

Egg clutches were more resistant to the insecticide Confidor: they were noted during all recording periods. New live larvae appeared after 14 days and a second treatment was needed. The biological effective-

ness of the preparation after 30 days was 55%, i.e., egg clutches (0.8/plant), live larvae (18 individuals/plant), and beetles (0.9 individuals/plant) were found, which required a third treatment.

The biological effectiveness of the preparation was affected by the temperature factor because during potato growth (June and July) the air temperature was above 25°C. The preparation Confidor was less effective at a high temperature than Regent-800 and Actara.

In the case of treatment with Regent-800 and Actara, damage of more than 50% of the potato leaf surface was not found after 14 and 30 days, but in the variant with Confidor it was high (more than 75% during all recording times), Table 2.

With treatment of potatoes against Colorado beetle with Regent-800, the yield of potato tubers was 16.6–27.7% higher than in variants with Actara and Confidor.

Thus, the results of five-year investigations showed maximum biological effectiveness of Regent-800 for controlling the Colorado potato beetle.

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