

## Effectiveness of Atonik SL in the control of powdery mildew, black spot, and rust

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### ABSTRACT

Atonik SL at concentration 0.1% applied 4-times at weekly intervals as a rose shrub spray against *Sphaerotheca pannosa* var. *rosae* gave more than 3-times lower disease appearance. Also when used in the same program against *Sphaerotheca humuli* on *Viola wittrockiana* on protected plants, powdery mildew symptoms were noted only sporadically. In a field experiment Atonik SL used as a rose spray 9-times at weekly intervals against *Diplocarpon rosae* gave more than 3-times lower disease incidence than on control plants. On willow protected against *Melampsora epitea* about 7-times lower number of uredia were noted on leaves protected with Atonik SL. Also in the case of chrysanthemum protected against *Puccinia horiana* an about 5-times lower number of telia was noted on leaves in comparison with untreated plants.

## INTRODUCTION

In research conducted so far, Atonik found application as a compound increasing the crop, its quality, or affecting improvement of plants condition, their bushing and rooting. Data concerning the effectiveness of Atonik in crop improvement are various and depend on plant species and sometimes also on variety. Arora et al. (1982) used Atonic at concentration 0.05% to spray tomato at flowering, 7 days later, or at fruit set and found that its compounds used 7 days after flowering gave about a 37% increase of crop. Also Sumiati (1989), who used Atonik 0.15% for tomato spray, obtained about a 29% increase of crop. Tomato sprayed twice with Atonik at the beginning of flowering and beginning of fruit set on the first truss increased the number of fruits by about 24% and crop by 20% (Shi and Shi 1999). Atonik at concentration 0.08% used 3-times at weekly intervals, before flowering of hot pepper, increased yield about 13% (Srinivas et al. 1986). When used for foliar spray of sugarbeet, it increased yield by 3-5% (Zahradnicek and Pulkrabek 2001). When its compounds were applied at concentration 0.05% to 0.1% for spraying apple cultivars in the 10 days after petals fall, they did not affect the fruit yield but increased the number of fruits >65 mm in diameter by 12-16% (Koupil 1997). Atonik, applied immediately after harvest, increased the yield of strawberry cultivars by 3 to 30% in the following year (Eftimov 1988). Onion sprayed with Atonik (0.02% or 0.05%) 15 and 45 days after transplanting resulted in a significant increase in the number of roots per plant and gross yield (Bhonde et al. 1992). Similar results were obtained in earlier experiments of Karantonis (1973) when basal or apical ends of vine cuttings were soaked in 1% Atonic for 12 hrs. Treating of apical ends with Atonic increased rooting by up to 21%, but treating basal ends did not give satisfactory results. Atonik at concentration 0.05 or 0.1% used for spray of *Pitcairnia angustifolia* (*Bromeliaceae*) significantly increased the number of buds produced (Widiastoety 1987).

Data concerning the usage of the product mentioned above against diseases are relatively small. In Saniewska's (1999) study, Atonik at concentration 0.1% applied as a spray 4-times at weekly intervals significantly decreased spreading of *Puccinia antirrhini* on snapdragon. The product used as a plant spray strongly decreased the development of *Melampsora epitea* on willow, *Erysiphe biocellata* on *Mentha*, *Septoria rhododendri* on *Rhododendron* and *Phoma* sp. on *Ajuga reptans* leaves (Orlikowski and Wojdyła 1999).

In this study effectiveness of Atonik SL used for protection of roses against *Sphaerotheca pannosa* var. *rosae* and *Diplocarpon rosae*, garden pansy against *Sphaerotheca humuli*, goat willow 'Iva' against *Melampsora epitea* and chrysanthemum against *Puccinia horiana* was evaluated.

## MATERIAL AND METHODS

Atonik SL (0.03 dm<sup>3</sup> para nitrophenolates sodium + 0.02 dm<sup>3</sup> ortho nitrophenolates sodium + 0.01 dm<sup>3</sup> 5-nitroguayacolate sodium per dm<sup>3</sup>) was applied as a foliar spray until the foliage was thoroughly covered but the solution was not allowed to drip off. The control plants were sprayed with tap water at the same time. Triforine (Saprol 190 EC) or mancozeb (Dithane M-45 80 WP) were used as the standards. Citowett AL at concentration 0.01% was added to the spraying mixture. After certified powdery mildew (*S. pannosa* (Wallr. ex Fr.) Lev. var. *rosae* Wor.) symptoms on roses 'Madelon' cultivated in the plastic tunnel, plants were sprayed with Atonik SL at concentration 0.1% 4-times at weekly intervals. Also in the case of *Viola wittrockiana* Gams., cultivated in flower pots of 10 cm in diameter placed in greenhouse on sills, Atonik SL at concentration 0.1% was used for plant spraying against powdery mildew (*S. humuli* DC.). Disease incidence on rose shrubs and pansy plants was evaluated before the first spraying and then after 2 or 4 weeks, using a 6-degree scale (Tables 1 and 2). In ground cultivation of roses Atonik SL was used for protection against black spot (*D. rosae* Wolf). When the first symptoms of disease appeared on the leaves, shrubs were sprayed 10-times at weekly intervals. The effectiveness of tested compounds was evaluated after 3, 6, and 9 weeks of the experiment according to a 7-degree scale (Table 3).

Willow with initial symptoms of rust (*M. epitea* Thüm.) on leaves was sprayed with Atonik SL at concentration 0.1% twice at weekly intervals. In greenhouse cultivation Atonik SL was used against white rust (*P. horiana* P. Henn.) on pot chrysanthemum 'Fiji Yellow'. After the appearance of first disease symptoms, plants were sprayed with Atonik SL 4-times at weekly intervals. After 2 (willow) and 4 weeks (chrysanthemum) the number of uredia/telia, percent of dried uredia/telia per leaf, and percent of infected leaves were counted.

The experiments were set in a block design with 4 replications and 5 plants or shoots in each replication. The results obtained were elaborated statistically by analysis of variance. Mean differences were evaluated with Duncan's t-test at  $p = 0.05$ .

## RESULTS AND DISCUSSION

After the first two sprayings with Atonik SL and triforine the researches proved a more than 2-times lower degree of rose infection by *S. pannosa* var. *rosae* (Table 1). After the next two treatments with Atonik SL only about 5% of shoot surface was covered with the pathogen, whereas on control roses almost 20%. After 2 and 4 treatments of pansy plants with Atonik SL lower than 1% of leaf surface was covered with *S. humuli* similarly to using triforine, while on control plants about 8% of leaf surface was covered with the fungus (Table 2). High

effectiveness of Atonik against powdery mildew had been shown in earlier researches carried out on *Mentha* (Orlikowski and Wojdyła 1999).

Table 1. Effectiveness of Atonik SL in control of *Sphaerotheca pannosa* var. *rosae* on rose 'Madelon' expressed in mean degree of shrub infection\*; beginning of experiment: 1997.07.21, initial infection level: 2.5

Treatment	Concentration %	Weeks after first spraying	
		2	4
Control	-	4.5 b	4.6 c
Triforine (standard)	0.03	2.1 a	0.8 a
Atonik SL	0.1	2.1 a	1.5 b

Note: Means, within columns, followed by the same letter are not significantly different at  $p = 0.05$

\* 6-degree scale of plant infection: 0 – no symptoms, 1 – up to 1% of plant area covered with mycelium, 2 – 1.1 to 5%, 3 – 5.1 to 10%, 4 – 10.1 to 20%, 5 – over 20% of shoot area covered with fungus

Table 2. Effectiveness of Atonik SL in control of *Sphaerotheca humuli* on *Viola wittrockiana* 'Beaconsfield' expressed in mean degree of plant infection\*; beginning of experiment: 2001.10.21, initial infection level = 2.18

Treatment	Concentration %	Weeks after first spraying	
		2	4
Control	-	2.8 c	2.5 c
Triforine (standard)	0.03	0.5 a	0.1 a
Atonik SL	0.1	0.9 b	0.4 b

Note: See Table 1

\*Disease index: See Table 1

In rose protection against *D. rosae* after 3 and 6 weeks of investigations, the infection of plants treated with Atonik SL was almost 3 or 5-times lower than on control plants (Table 3). After 9 weeks over 50% of fallen leaves was noted on control plants, and the rest showed spot symptoms. On shrubs sprayed with Atonik SL an almost 3-times lower degree of infection was observed. Also in earlier researches high effectiveness of this product against leaf spot had been proved on *Rhododendron* and *Ajuga reptans* (Orlikowski and Wojdyła 1999).

After 2 weeks of willow protection against *M. epitea*, the investigated compounds reduced the formation of uredia on leaves about 7-times (Table 4). On control plants no drying uredia were seen, while on plants treated with Atonik SL about 15% of them were drying. High effectiveness of Atonik SL against *Puccinia antirrhini* on snapdragon had been observed by Saniewska (1999).

Table 3. Effectiveness of Atonik SL in control of *Diplocarpon rosae* on rose 'Sandra' expressed in mean degree of shrub infection\*; beginning of experiment: 1997.07.29, initial infection level = 0.84

Treatment	Concentration %	Weeks after first spraying		
		3	6	9
Control	-	2.3 b	3.8 c	4.5 c
Triforine (standard)	0.03	0.1 a	0.5 a	0.4 a
Atonik SL	0.1	0.8 ab	0.8 b	1.2 b

Note: See Table 1

7-degree scale of plant infection: 0 – no disease symptoms, 1 – from 0.1 to 25% of leaves with disease symptoms, 2 – over 25% of leaves with disease symptoms, 3 – up to 25% of fallen leaves and the rest with disease symptoms, 4 – from 25 to 50% of fallen leaves, 5 – from 50 to 90% of fallen leaves, 6 – over 90% of fallen leaves

Table 4. Effectiveness of Atonik SL in control of *Melampsora epitea* on willow; beginning of experiment: 1999.06.30, initial percentage of diseased leaves = 28.7

Treatment	Concentration %	Mean number of spots per leaf	% of diseased leaves	% of destroyed pustules
Control	-	28.9 c	91.2 b	0 a
Triforine (standard)	0.03	0.7 a	27.2 a	100 c
Atonik SL	0.1	4.4 b	44.2 a	15 b

Note: See Table 1

After 4 treatments of chrysanthemum with Atonik SL, about 5-times fewer spots per leaf than on control plants were found (Table 5). Also the percentage of infected leaves was 1.5-time lower than on plants which had no treatment. On chrysanthemum leaves protected with Atonik SL the diameter of spots was in fact lower than on plants treated with mancozeb.

Table 5. Effectiveness of Atonik SL in control of *Puccinia horiana* on chrysanthemum 'Fiji Yellow'; beginning of experiment: 1998.03.20

Treatment	Concentration %	Mean number of spots per leaf	% of diseased leaves	Diameter of spots (mm)	Height of plants (cm)
Control	-	17.2 b	63.1 b	4.3 b	40.5 b
Mancozeb (standard)	0.16	1.6 a	27.2 a	5.2 c	34.7 a
Atonik SL	0.1	3.5 a	40.6 b	3.2 a	33.5 a

Note: See Table 1

## CONCLUSIONS

1. Atonik SL at concentration 0.1%, used for spraying with 7-day-frequency against powdery mildew on rose and pansy, showed an effectiveness similar to triforine.
2. Atonik SL used against black spot on roses, reduced the degree of shrub infection over 3-times but was less effective than triforine.
3. Atonik SL used against willow rust, caused almost 7-times reduction in uredia number.
4. The product used against chrysanthemum rust showed effectiveness similar to mancozeb.

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#### SKUTECZNOŚĆ ŚRODKA ATONIK SL W OCHRONIE NIEKTÓRYCH GATUNKÓW ROŚLIN OZDOBNYCH PRZED CHOROBYMI

**Streszczenie:** Atonik SL 0,1%, stosowany 4-krotnie co 7 dni do ochrony róż przed *Sphaerotheca pannosa* var. *rosae*, powodował ponad 3-krotne obniżenie stopnia porażenia krzewów. Produkt użyty w takim samym programie do zwalczania *Sphaerotheca humuli* na bratku powodował, że objawy chorobowe występowały na roślinach tylko sporadycznie. Atonik SL stosowany co 7 dni w warunkach polowych do 9-krotnego opryskiwania róż w ochronie przed *Diplocarpon rosae* powodował ponad 3-krotne zmniejszenie nasilenia objawów chorobowych. Na wierzbie opryskiwanej 2-krotnie co 7 dni w ochronie przed *Melampsora epitea* stwierdzono około 7-krotnie mniej skupień uredyniów w porównaniu z liśćmi roślin nie opryskiwanych. Również na chryzantemach uprawianych w szklarni, opryskiwanych 4-krotnie co 7 dni w celu ograniczenia rozwoju *Puccinia horiana* stwierdzono ponad 5-krotnie mniej formowanych skupień telii aniżeli na liściach roślin kontrolnych.

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