Biological efficacy of the chemical chrysanthemums protection with the use of fine and coarse droplets.

Skuteczność biologiczna ochrony chryzantem z wykorzystaniem drobnej i grubej kropli

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ABSTRACT

Studies of three years (2007-2009) were conducted at Czesławice in south-east of Poland .The objects of research were the plants of the one cultivar of chrysanthemum: Dark Tripoli. The following agents were used for protection: Dithane NeoTec 75 WG, Sumilex 500 SC, Amistar 250 SC. The treatment was carried out with the use of two types of nozzles: standard RS-MM 110 03 and ejector type ID 120 03 C. Observation was carried out once a year: in October. The number and health status of plants were determined and diseased plants were collected for analysis. The percentage of plants with disease symptoms was estimated for each plot. The best health status and yield were noticed for Amistar 250 SC.

KEYWORDS: chrysanthemum, biological efficacy, fine droplets, coarse droplets

STRESZCZENIE

W pracy przedstawiono wyniki doświadczenia polowego ochrony fungicydowej chryzantemy odmiany *Ciemne Tripolis*. Badania był prowadzone w gospodarstwie doświadczalnym w Czesławicach, położonych na południowym wschodzie Polski. Doświadczenie było prowadzone metodą blokową. Do ochrony roślin chryzantemy użyto trzech rodzajów fungicydów: Dithane NeoTec 75 WG, Sumilex 500 SC, Amistar 250 SC. Fungicydy były nanoszone metodą oprysku z wykorzystaniem dwóch rodzajów rozpylaczy szczelinowych.
Rozpylacz standardowy MM 110 03 firmy (Marian Mikołajczyk), oraz rozpylacz antydryfowy ażektorowy ID 120 03C firmy (Lechler). Obserwacje stanu zdrowotności roślin przeprowadzano, co roku w październiku. Oceniano wysokość roślin, średnicę roślin i stopień porażenia. Najlepsze efekty ochrony odnotowano na poletkach gdzie był stosowany fungicyd Amistar 250C, bez względu na to, jakiego rodzaju rozpylaczem był nanoszony na rośliny.

STRESZCZENIE SZCZEGÓŁOWE

Chryzantema (*Chrysanthemum grandiflorum* Ramat./Kitam.) jest ważną rośliną ozdobną uprawianą w Polsce pod osłonami oraz w gruncie. Roślina ta jest często porażana przez patogeny. Szczególną rolę odgrywają patogeny pochodzenia grzybowego zasiedlające liście oraz glebę. Szczególnie licznie występują grzyby *Puccinia horiana*, *Botrytis cinerea, Sclerotinia sclerotiorum* oraz liczne gatunki z rodzaju *Fusarium*. Celem badań było określenie wpływu fungicydów nanoszonych przy użyciu rozpylaczy płaskostrumieniowych standartowych i antyznoszenioweych ežektorowych na zdrowotność chryzantemy ogrodowej Tripoli Darc uprawianej w polu. Odmiana ta uchodzi za średnio podatną na patogeny grzybowe. Badania był prowadzone w latach 2007-2009 w gospodarstwie doświadczalnym w Czesławicach na południowym wschodzie Polski. Doświadczenie było prowadzone metoda blokową. Do ochrony roślin chryzantemy użyto trzech rodzajów fungicydów: Dithane NeoTec 75 WG, Sumilex 500 SC, Amistar 250 SC. Fungicydy były nanoszone metodą oprysku z wykorzystanie dwóch rodzajów rozpylaczy szczelinowych. Rozpylacz standartowy MM 110 03 firmy (Marian Mikołajczyk), oraz rozpylacz antydryfowy ežektorowy ID 120 03C firmy (Lechler). Obserwacje stanu zdrowotności roślin przeprowadzano, co roku w październiku. Oceniano wysokość roślin, średnicę roślin i stopień porażenia. Najlepsze efekty ochrony odnotowano na poletkach gdzie był stosowany fungicyd Amistar 250C, bez względu na to, jakiego rodzaju rozpylaczem był nanoszony preparat na rośliny. Porównywano wzrost oraz średnicę roślin z poszczególnych poletek oraz porażenie roślin traktowanych trzema fungicydami z kontrolą.

SŁOWA KLUCZOWE: chryzantema, rozpylacz standartowy i ežektorowy, skuteczność biologiczna zabiegu ochrony roślin

INTRODUCTION

Chrysanthemum (*Chrysanthemum grandiflorum* Ramat./Kitam.) is an important world-wide grown and high-value crop, whose production has increased in recent years. In Poland, this ornamental is traditionally used for decorating tombs on All Saints Day. Unfortunately, the beauty of chrysanthemums is spoiled by many soil-borne and air-borne pathogens. Necrotic lesions, on roots, stems and leaves and wilt are the most common symptoms of the diseases. Among factors affecting the market value of chrysanthemums, fungal diseases are probably the most important. Soil-borne pathogens like *Rhizostonia solani, Sclerotinia sclerotiorum* and *Fusarium* spp. have the most dramatic impact on economics of chrysanthemum production as they can cause the death of plants (Kopacki and Wagner 2004).
The aim of the study was to determine the influence of the fungicides sprayed by means of standard and coarse droplet nozzles on the healthiness of the cv.

Dark Tripoli grown in fields. This brand is said to show an average influence of fungicide on pathogens.

MATERIALS AND METHODS

The experiment was set up with the method of random blocks. The healthiness of plants was estimated at the blooming period in October. The fields were sprayed four times in 14-day intervals using the preparation Dithane NeoTec 75 WG (a.i. mancozeb), Sumilex 500 SC (a.i. procymidone), as well as Amistar 250 SC (a.i. azoksystrobine). This activity was executed with the use of standard RS-MM 110 03 sprayers and thick drop nozzles ID 120 03. Pressure of spray amounted to 3 bars and working speed was 4 km/h. The dose recommended by the manufacturer of the fungicide was used. Crops from each field as well as the paralysis of plants treated with three fungicides were compared in a controlled way. The health status of plants was evaluated according to 4-grade scale: 0 - no symptoms, 1 – yellowing of bottom leaves, 2- yellow or necrotic spots on all leaves, 3 – wilting, 4 – death. The disease index was determined using McKinney formula (Łacicowa 1969). The data were processed by the McKinney's formula, which generates a numeric disease index (DI) of the severity of the attack where v represents the numeric value of the class, n is the number of plants assigned to the class, N is the total number of the plants in the replication and V is the numeric value of the highest class.

Disease index $=\Sigma vn/\Sigma NV*100\%$

Results were analysed statistically with Tukey's test (HSD) using SAS ver. 9.1 – SAS Inst., Cary, N.C., USA (Frątczak et al. 2005).

RESULTS

On the base of analysis of the results of three-year investigation it was discovered that the kind of nozzles which was used does not have influence on quality operation fight with fungus condition in the protection of plants. We saw the differences between monitored fields where we did not carry out the protection of plants and fields where this operation was. Among tested plants numerous disease symptoms were observed but the mean height and diameter of plants did not differ significantly from the control. Only height of plants in 2007 showed significant differences (Tab. 1, Tab. 2).
The strongest effect was observed for the chrysanthemums treated by Amistar 250 SC. Disease index ranged from 15,27% to 43,06% and differed significantly from the control only in 2008 (Tab. 3). The strongest effect was observed in the plants treated by Amistar 250 SC and Sumilex 500 SC which were used in thick drops nozzles ID with broad-spectrum of drops. The fungicide containing mancozeb (Dithane NeoTec 75 WG) was the least effective. Because we did not have enough parameters we must curry out more investigations about effectiveness of protection using different kinds of nozzles.

Table 1. Mean height of chrysanthemum plants
Tab. 1. Średnia wysokość roślin chryzantemy

Protection Środek ochrony roślin	Mean height of plants (cm) in years Średnia wysokość roślin (cm) w latach		
	2007	2008	2009
Control Kontrola	37.30b*	26.03a	28.44a
Dithane NeoTec 75WG	37.82ab	28.14a	28.86a
Dithane NeoTec 75 WG id	38.00ab	29.70a	28.52a
Sumilex 500 SC	38.67ab	25.64a	28.00a
Sumilex 500 SC id	38.52ab	26.22a	26.91a
Amistar 250 SC	40.10a	27.34a	27.30a
Amistar 250 SC id	40.00a	27.31a	29.41a
$NIR_{0,05}$	2.412	5.3152	3.69

*means followed be the same letter are not significantly different (Tukey test $p \leq 0,05$)

Table 2. Mean diameter of chrysanthemum plants
Tabela 2. Średnia średnica roślin chryzantemy

Protection Środek ochrony roślin	Mean diameter of plants (cm) in years Średnia średnica roślin (cm) w latach		
	2007	2008	2009
Control Kontrola	38.00a*	32.45a	34.14a
Dithane NeoTec 75WG	35.82a	31.72a	34.94a
Dithane NeoTec 75 WG id	39.15a	34.42a	33.28a
Sumilex 500 SC	39.05a	31.84a	33.89a
Sumilex 500 SC id	39.55a	32.39a	34.03a
Amistar 250 SC	39.40a	33.59a	35.78a
Amistar 250 SC id	38.00a	32.36a	36.89a
$NIR_{0,05}$	5.7032	5.0216	5.25

*means followed be the same letter are not significantly different (Tukey test $p \leq 0,05$)

Table 3. Mean disease index for chrysanthemum plants
Tabela 2. Średni indeks chorobowy dla roślin chryzantemy

Protection Środek ochrony roślin	Mean disease index of plants (%) in years Średni indeks chorobowy roślin (%) w latach		
	2007	2008	2009
Control Kontrola	31.50a*	43.06a	20.85a
Dithane NeoTec 75WG	26.25a	32.64b	16.65a
Dithane NeoTec 75 WG id	24.50a	18.75c	18.75a
Sumilex 500 SC	25.25a	33.34b	17.35a
Sumilex 500 SC id	23.75a	16.67c	17.35a
Amistar 250 SC	24.75a	22.92c	15.27a
Amistar 250 SC id	22.50a	15.28c	18.72a
$NIR_{0,05}$	19.505	8.1557	11.72

*means followed be the same letter are not significantly different (Tukey test $p \leq 0,05$)

DISCUSSION

The conducted research has shown very high effectiveness of Amistar 250 SC treatment in fighting diseases of chrysanthemums regardless of the used nozzles. Despite frequent production of breed of fungi (Cook 2001) this modern fungicide is often recommended to fight most of fungal diseases of vegetable and ornamental plants (Robak and Ostrowska 2006; Wojdyła 2002).

The two following preparation had a worse effect. Sumilex 500 SC had a differential effect on pathogens; however some effect of spray nozzles on effectiveness of treatment can be noticed. Compared with other substances, satisfactory effectiveness in fighting was noticed while producing vegetables in ecological system (Dłużniewski et al. 2008). In the conducted research, however, effectiveness was not too high. The similar situation was on the plots protected by the preparation based on mancoseb. This known for years protective fungicide has a quite effective protective treatment. However, it is not effective enough when plants are diseased stronger (Gullino et al. 2010; Urban and Filipowicz 2004). In the conducted research its effectiveness was not too high regardless of used nozzles.

Nevertheless, it can be thought that in difficult windy conditions antidrift nozzles will be applicable. Positive results of using these modern nozzles corroborate experiments with fertilizing, in which it was stated that using the antidrift nozzle has a beneficial influence on foliar fertilizing of crops, especially in adverse windy conditions. Italian research, in which the antidrift nozzle was used successfully to protect grapevines, corroborates this as well (Balsari et al. 2001).

CONCLUSIONS

1. Regarding the effect on health status and plant development strobilurine fungicide seemed to have the best influence on treated plants.
2. The type of nozzles has no significant effect on the effectiveness of the completed treatment.

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