EFFECTIVENESS OF BIOCHIKOL 020 PC IN THE CONTROL OF CARROT AND PARSLEY PATHOGENS

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1. Introduction

The occurrence of root rot during storage periods and planting for seeds is a large problem in parsley and carrot cultivation for seeds. Its main reason is found in infection caused by pathogenic bacteria and fungi. Kućmierz et al. [1] isolated from the infested carrot seedling roots: *Alternaria radicina, Botrytis cinerea, Fusarium culmorum, F. moniliforme, F. solani, Sclerotinia sclerotiorum, Rhizoctonia solani, Cladosporium herbarum* and *Epicoccum purpurascens*. Nawrocki [2, 3] and Mazur et al. [4] studies indicated that: *Alternaria radicina, Cylidrocarpon destructans, Fusarium avenaceum, F. culmorum, F. oxysporum, Rhizoctonia solani* and *Sclerotinia sclerotiorum* were the most pathogenic for the parsley.

One of the methods to reduce pathogenic fungi is chemical dressing of carrot and parsley roots. Earlier studies were connected with effectiveness of chemical dressing of carrot roots using standard fungicides [5] but there are lack of information about effectiveness of Biochikol 020 PC and Biosept 33 SL in control of carrot seedling roots. In previous studies of Nawrocki and Mazur [6] the autumn dressing of parsley roots before storage period was not effective. The best efficacy among tested compounds exhibited Zaprawa Funaben T. In Pastucha and Patkowska [7] investigations Biosept was the most effective in the control of pea pathogens. The effectiveness of Biosept in the control of ornamental were shown by Orlikowski and Skrzypczak [8]. Biochikol 020 PC (2% of chitosan) is the inducer of plants resistance, which can show an anti-viral, anti-bacterial and anti-fungal effect [9 - 11].

The aim of this work was to determine an effect of Biochikol 020 PC and other tested substances in the control of parsley and carrot cultivation for seeds.

2. Materials and methods

Field experiments were carried out in the years 2004-2005 on carrot roots cv. 'Koral' and 'Perfekcja', and parsley cv. 'Berlińska' and 'Cukrowa'. Roots without any symptoms of disease were treated with: Biochikol 020 and Biosept 33 SL (33% of grapefruit extract) at dose 2,5%, and standard fungicides: Sportak Alpha 380 EC (prochloraz 300 g/dm^3 + carbendazim 80 g/dm^3) and Zaprawa Funaben T (carbendazim 20% + tiuram 45%) at dose 300 g × 100 kg^{-1} roots. Roots of carrot and parsley were treated one of tested substances, immediately before planting seedling roots. Roots without any chemical dressing were used as the control. Each combination contained 10 single roots in 3 replications. During vegetation period the growth of seedling shoots and setting of seeds were noticed. At the end of the experiments (October) number of grown-up seedlings and yield of seeds were estimated. Diseased plants were subjected to laboratory for microbiological analysis according to the procedure presented by Kućmierz et al. [12]. The obtained results were statistically verified by Duncan's test, at 5% significance level.

3. Results and discussion

The results showed, that the highest number of seedling shoots from 1 parsley root seedling was obtained from combination with Zaprawa Funaben T, in 2004 on cv. 'Cukrowa' and in 2005 on cv. 'Berlińska' (Figure 1). The similar results were obtained with the carrot seedling roots cvs 'Koral' and 'Perfekcja' dressed ZFT in both years of investigations (Figure 2). However the lowest number of seedling shoots were received from control carrot and parsley seedling roots. Activity of Biochikol and Biosept was not satisfied. In Kućmierz et al. [1, 12] investigations with standard fungicides used for carrot root dressing before storage, the greatest efficiency was exhibited also by Zaprawa Funaben T and Zaprawa Nasienna T. In our previous experiments [6] the best efficacy among the tested products was obtained with Zaprawa Funaben T and the worst with chitosan in the control of parsley seedling roots. Biosept 33 SL was the most effective among the tested biopreparations in the protection of pea against pathogenic fungi [7].

After vegetation periods, during autumn analysis the highest seed yield from 1 plant was obtained from parsley plants cvs 'Berlińska' and 'Cukrowa' grown from roots dressed with standard fungicides Sportak Alpha and Zaprawa Funaben T. The effectiveness of Biochikol and Biosept was lower in comparison with the standard fungicides, but their protective effect on parsley seed yields was significantly higher than in control, especially on cv. 'Berlińska' (Figure 3). In both years of investigations the biggest amount of seeds from 1 carrot plant was obtained from roots cvs. 'Koral' and 'Perfekcja' dressed Zaprawa Funaben T. The least quantity of carrot seeds was acquired from plants in the control. The effectiveness of Biochikol and Biosept in control of carrots was lower than standard fungicides in 2004 and 2005 years (Figure 4).

The mycological analysis of carrot and parsley plants in 2004 year showed, that the main reason of seedling root and shoot decay was *Sclerotinia sclerotiorum* and bacteria caused soft rot. In 2005 from the decay plants various community of rot fungi were isolated.

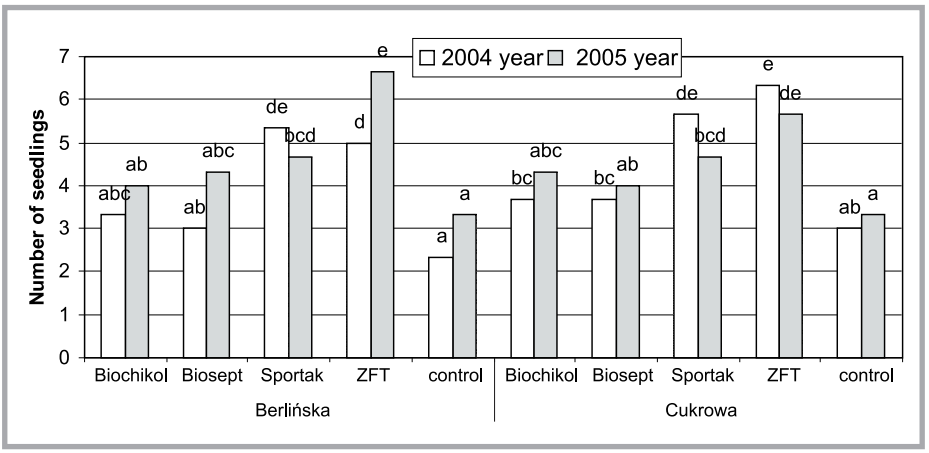

Figure 1. *Mean number of seedlings obtained from 10 roots - parsley;* ***Note:*** *means followed by the same letter do not differ at 5% level of significance (Duncan's multiple range test).*

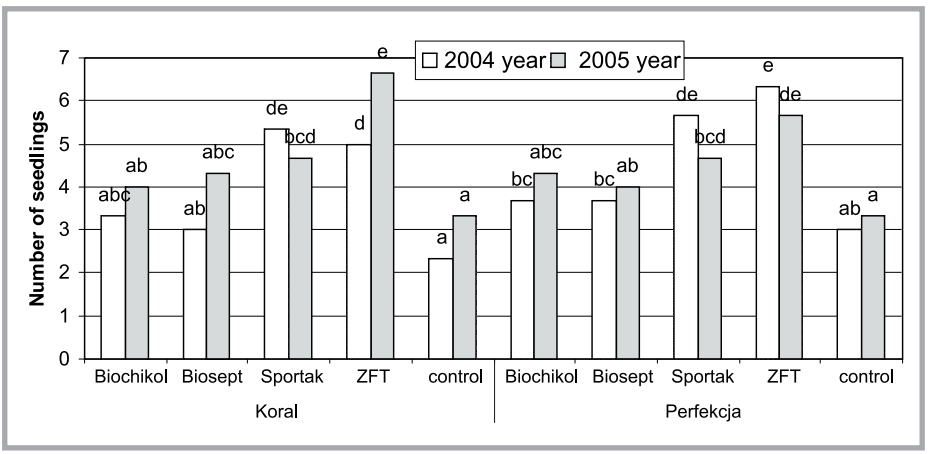

Figure 2. *Mean number of seedlings obtained from 10 roots of carrot;* ***Note:*** *as Figrure 1.*

Beside, bacteria and *Sclerotinia sclerotiorum* as well as: *Alternaria, Fusarium, Pythium, Rhizoctonia* and *Phoma* were also isolated. These fungi were the most pathogenic for roots and seedlings plants of carrot and parsley in Kućmierz [1] and Nawrocki previous experiments [3].

The results of mycological analysis of carrot and parsley seeds indicated, that there were not significant differences between combinations of seed infestation by fungi species. The most common inhabitants of parsley and carrot seeds were fungi from species *Alternaria* (especially *A. radicina* and *A. alternata*). In 2004 seed infestation by *Alternaria* species was higher than in 2005, reached 86% of all obtained isolates from combination - Berlińska control. The great participation on carrot and parsley seeds had also fungi from genus

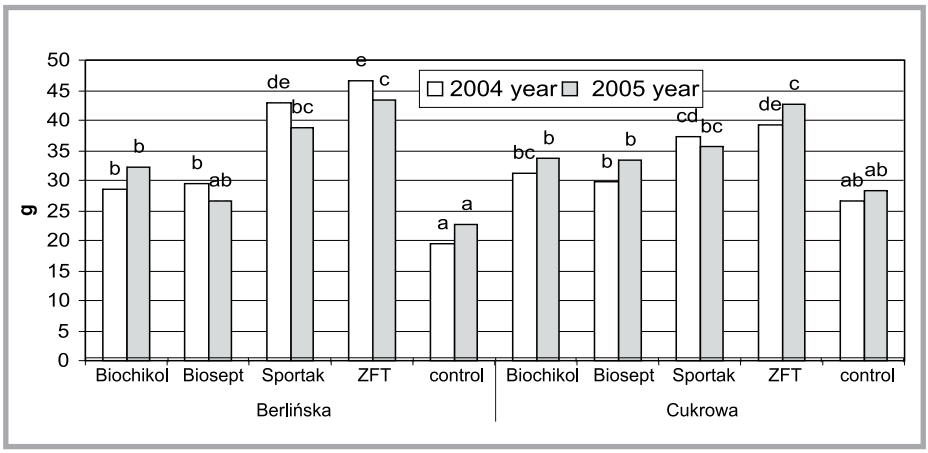

***Figure 3. Mean yield of seeds obtained from 1 plants of parsley**; **Note:** as Figrure 1.*

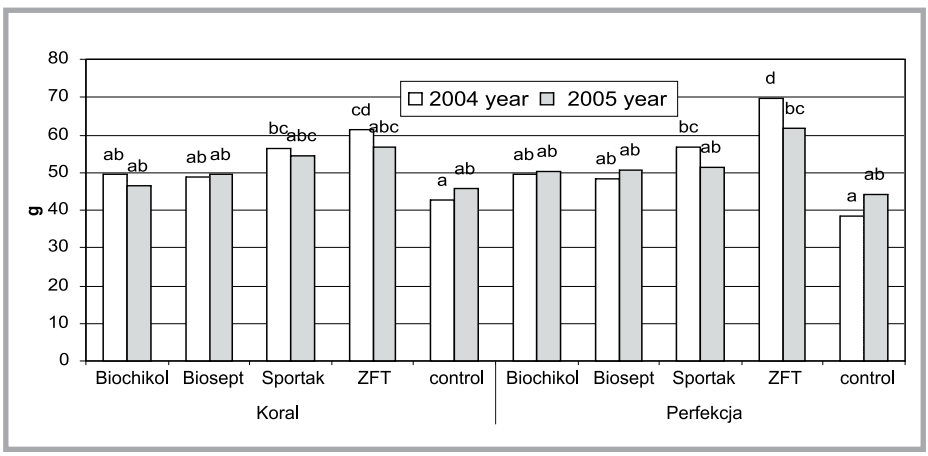

***Figure 4.** Mean yield of seeds obtained from 1 plants of carrot; **Note:** as Figrure 1.*

Fusarium. Fungi from species Alternaria were mainly obtained by Nowicki [13] using filter paper method from parsley seeds cv. 'Berlińska', 'Cukrowa' and 'Lenka' and Nawrocki [14] on PDA medium.

4. Conclusions

Among substances used for spring dressing of carrot and parsley seedling roots, the best efficacy was obtained with Zaprawa Funaben T in both years of observations.

Sportak Alpha influenced the increase of seed yield.

Effectiveness of Biochikol and Biosept was not satisfied in comparison with standard fungicides, but their protective effect on parsley seed yields was significantly higher than in the control.

5. References

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