THE INFLUENCE OF PATHOGENIC ORGANISMS ON GROWTH AND PRODUCTION OF CHENOPODIUM QUINOA WILLD. UNDER THE CONDITIONS OF THE CZECH REPUBLIC

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Abstract: In this study we assessed the influence pathogenic organisms on growth and production of *Chenopodium quinoa* Willd. under the conditions of the Czech Republic. This species has its origin in South America and recently has been introduced to Europe. There is considerable lack of information about its reactions to European pests and diseases that have the potential to threaten the yield of this perspective crop. The research was conducted on six genotypes of *Ch. quinoa* that can be grown in Europe. Three agro-technical methods were tested and their impact on the intensity of infection caused by pathogenic organisms was evaluated. The outcome of this experiment will be in-depth description of all pests and diseases of this crop and the assessment of their impact on *Ch. quinoa* growth, yield and nutritional value.

Key Words: Genotype, *Chenopodium quinoa Willd.*, *Perenospora farinosa* (Fr.) Fr., pathogenic organisms

INTRODUCTION

In Central Europe *Chenopodium quinoa Willd.* is not widespread crop, however it is very perspective. Because of its high adaptability and tolerance to drought it can potentially become very important crop under the conditions of future climate change (Keppel 2012). Due to its high nutritional value it can supplement or substitute products made out of wheat and other cereals that are frequently used in Europe (Praslička et al. 1997). Grain is used to make gluten-free flour and it contains some amino acids that are deficient in commonly grown cereals.

There is still not so much information about pathogenic organisms infecting *Ch. quinoa* under the European conditions. They could have significantly negative impact on successful growth and production. Infection could also affect nutritional properties of grain (Voženilkova et al. 2004, Gunatilaka 2006). The most frequent pathogen, whose occurrence is expectable also in Central Europe, is *Peronospora farinosa* (Fr.) Fr. However, there are likely to be many more pathogenic organisms invading the plant tissues (Boerema et al. 1977). Under the terms of this project we will try to describe them in detail.

The main aim of this research is thorough examination and description of fungal diseases and insect pests infesting this crop. The second aim is to compare the level of damage between 6 genotypes of *Ch. quinoa* that are able to be grown under the conditions of Central Europe. We intend to test the influence of three different agrotechnical measures on the intensity of infection by pathogenic agents.

MATERIAL AND METHODS

The research plot was founded in University Agriculture Enterprise Žabčice. In total 1440 m^2 were sowed. Six genotypes were used in three repetitions. The crop was grown in rows 4 x 20 m, variants

were positioned randomly. Assessment was done on randomly selected 1800 plants in three repetitions. Within each repetition 600 plants per variant and 300 per genotype were evaluated. Height, height of stem with leaves and height of panicle were measured on each plant. At the same time we evaluated damage caused by fungi and insects – these parameters were expressed as a percentage of damaged leaf area with regard to significance of particular damage for subsequent plant growth. Species of pathogenic organisms were being determined over the course of entire research.

Three agrotechnical measures were tested. The first variant was left without any measure, the second was treated with regular mechanical removal of weed, within the third variant the weed was removed and calcium nitre applied.

Effect of pathogenic agents on the quantity of aminoacids was tested on 10 selected plants. Grain was cleaned, ground, macerated in water for 24 hours, filtrated, centrifuged and analysed with HPLC with UV detection.

Statistical analysis will be carried out in STATISTICA 12. Kruskal-Wallis test will be used if prerequisites are not met for parametric methods (Shapiro-Wilk's test – normality, Leven's test – homogeneity of variances), otherwise ANOVA can be used. Significance level will be 5% (α=0,05).

RESULTS AND DISCUSSION

Results of this research has not been statistically evaluated yet and will be presented under the terms of the presentation within the congress. Preliminary results show that there are many pathogenic agents causing damage to *Ch. quinoa* in Europe, especially insects. These pests induce (e.g. *Bothynoderes affinis* Schr., *Pieris brassicae* L., Aphidydae) medium damage (in average 20–30% destroyed leaf area) and locally mortality (up to 5%). Fungal diseases (e.g. *Peronospora farinosa* Fr., Urediales) were observed as well, but with considerably less intensity (around 10% damage), probably due to very hot and dry season. Mortality due to fungal infections has not been registered yet. There were considerable differences between genotypes and variants. Premiminary results indicate that the least damaged genotypes are QTC and QBH with a total of 5 – 10% assimilation apparatus damage. The QP genotype showed the highest assimilation apparatus damage with a total of 20%. Current data suggest that the variant with no maintenance is the most suitable for *Chenopodium quinoa* growing compared with the variants with different agrotechnical measures. The variant with the use of weeding and a fertilizer application ($Ca(NO_3)_2$) proved to be the least suitable. It seems that the pathogenic agents could have significant impact on amino acids content in grain.

CONCLUSION

Pathogenic organisms infesting *Ch. quinoa* were described. Susceptibility of six genotypes to pathogenic agents was tested. Impact of pests and diseases on growth, yield and amino acids content was evaluated. Several pests and diseases invading *Ch. quinoa* under the European conditions were identified. Significant differences in resistance of different genotypes to infection were observed. There were also significant differences between agrotechnical variants. Pathogenic agents are likely to have impact on amino acids content in grain.

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