IZVEĆEK


Ključne besede: interferenca, rastline, alelopatija, Solanum nigrum, Nicotiana tabacum, Abutilon theophrasti, Asclepis syriaca, Cirsium arvense, Convolvulus arvensis, ObPV virus

PLANT-PLANT AND PLANT-VIRUS INTERACTIONS

ABSTRACT

Interaction among higher plants is called interference. One type of it is called as competition, while the other type is called alelopathy. In case of predominance of alelopathy, donor plants excrete secondary metabolites, which always have inhibitory effect on the recipient (acceptor) species. Today the term alelopathy has been broadened, including not only plant-plant, but also plant-microorganisms interactions. The aim of our present work was to study the effect of
some allelopathic weeds on the development on recipient species and virus concentration. Donor species (Solanum nigrum, Nicotiana tabacum 'Samsun') were sprayed or watered daily with the water extracts of Abutilon theophrasti, Asclepias syriaca, Cirsium arvense, Convolvulus arvensis shoots, and those of A. syriaca roots. Test plants were inoculated at 4-6 leaf stage with Obuda pepper virus (ObPV). Five weeks after inoculation the fresh weight of the test plants were measured. Virus infection was evaluated by DAS ELISA method, and virus concentration in hosts was determined on the basis of extinction values. Fresh weight of S. nigrum was reduced by 41 and 43%, due to A. syriaca root and C. arvense shoot extracts. Plant water extracts did not reduce virus concentration in S. nigrum. Virus concentration in N. tabacum 'Samsun' was significantly reduced due to A. syriaca root, and C. arvense shoot extracts. Development of N. tabacum 'Samsun' plants was considerably inhibited due to A. syriaca and A. theophrasti shoot extracts. On the basis of our results no relation was observed between allelopathic inhibitory effect on the test plants and host-virus relations.

Key words: allelopathy, growth, inhibitors, plant extracts, viruses

1. INTRODUCTION

The term allelopathy was introduced by Molish (1937) at the first time. Earlier it was considered as a type of interference among higher plants, where products of secondary metabolism inhibit (less promote) the development and physiological processes of neighbourhood plants (Rice 1984). The term allelopathy has been extended recently including not only plant-plant, but also plant - microorganism interactions (Macias et al., 2002), and is considered as a new alternative way for biological weed control (Duke et al., 2002, Dikic et al., 2003).

Plant viruses make up about 15-30 % out of the whole plant diseases. Virus particles create extremely close biological units with the host cell. The biosynthesis of viruses is done by the organelles of the host cell. Therefore chemical protection against viruses is unsuccessful in vivo and causes the death of the plant host cell at the same time. In spite of this, some natural substances are known to inhibit the replication and cell- to cell movement of viruses and to reduce virus concentration (Moraes 1974; Banarwal and Verma 1997; Manickam and Rajappan 1998; Vivanco et al., 1999). The mode of action of natural substances is not yet known exactly, but it can be presumed, that these substances may modify special receptor places on the plant cell surface, therefore adhesion of virus particles can not be happened (Ragetti and Weintraub 1974, Gáborjánnyi and Tóbiás 1986).

The aim of our investigations was to study the effect of allelopathic weed extracts on host-virus relations.

2. MATERIALS AND METHODS

Fresh shoots and roots of Asclepias syriaca, while shoots of Abutilon theophrasti, Cirsium arvense and Convolvulus arvensis were collected at the beginning of flowering near Keszthely, in 2004. The roots and shoots were cut into small pieces in a grinder. After grinding, 25 g fresh biomass was stirred into 100 ml distilled water and left for a day. Then the mixtures were filtered through filter paper (MN 640w), and the water extracts were used to spray or water (50 ml water extract pot⁻¹) daily the test plants from their 2-4 leaf stage until the end of experiments. Nicotiana tabacum 'Samsun' and Solanum nigrum as test plants were mechanically inoculated with Obuda pepper virus (ObPV).
In order to evaluate virus inhibitory effect of plant extracts in their systemic hosts, DAS ELISA serological method was used five weeks after inoculation (Clark and Adams 1977) and the fresh weight of the test plants were also measured at the same time. Extinction values were measured 20 minutes after adding the substrate at 405 nm wavelength by Multiscan ELISA reader. The higher the concentration of viruses in the plant samples, the higher extinction values were measured, therefore from the extinction values one could conclude to the virus concentration. Test samples were considered resistant to virus infection if their extinction values did not exceed two times those of the negative (uninfected) control ones. Analysis of variance (ANOVA) has been done with susceptible, virus infected plant samples (where the extinction values were more than two times higher than the extinction values of the negative control samples), in order to determine the effect the extracts on the virus concentration in hosts as compared to the positive control samples. Virus infected plants without extract using served as positive control.

3. RESULTS AND DISCUSSION

It has been seemed that in systemic host-virus relations root and shoot extracts of weeds did not inhibit virus infection, because extinction values were more than two times higher than those of the negative control samples. In a previous study, some plant extracts significantly reduced the number of the local lesions (Takács et al., 2004). Sprayed plant water extracts did not reduce significantly OBPV concentration in S. nigrum, although considerable, 41 and 43 % reduction in fresh weight had been observed due to A. syriaca root and C. arvense shoot extracts, respectively (Fig 1. and 2.). Virus concentration in N. tabacum ‘Samsun’ host was significantly reduced due to A. syriaca root, and C. arvense shoot extracts. Development of N. tabacum ‘Samsun’ plants was considerably inhibited due to A. syriaca and A. theophrasti shoot extracts (Fig 3. and 4.). When plant extracts were used for watering the pots differences neither in virus concentration nor in fresh weight had been observed, as compared to control samples.

![Graph showing extinction values](image_url)
Fig. 2

Fig. 3

Fig. 4
4. CONCLUSIONS

Plant extracts had a stronger inhibitory effect on the development of the test plants, than on the virus concentration in the hosts. These results coincide with the known allelopathic effect of *A. syriaca*, *C. arvense* and *A. theophrasti* (Kazinczi et al., 1991, 1999, 2004). *A. syriaca* root and *C. arvense* shoot extracts reduced fresh weight of *S. nigrum*, but not that of *N. tabacum* ‘Samsun’. Nevertheless these extracts significantly reduced ObPV concentration in *N. tabacum* ‘Samsun’, but not in *S. nigrum*. Our preliminary results show that there is no relation between allelopathic inhibitory effect of weeds on the development of test plants and virus inhibitory effect in the hosts. Better results were obtained from those experiments, where target was to study the virus inhibitory effect of some herbicides in the hosts (Kazinczi et al., 2002, 2003).

5. ACKNOWLEDGEMENT

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6. REFERENCES


