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ROLE OF THE ALLELOPATHY IN MIXED VEGETABLE CROPS IN THE ORGANIC FARMING

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Abstract

The main objective of organic farming is the preservation of natural resources and agricultural productivity with minimal negative impact on the environment.
Organic gardening differs from conventional vegetable production in the system, ways and peculiarities output fighting weeds, pests and diseases.
The allelopathy is identified as one of the factors that regulate the growth and distribution of plant communities in natural and cultural agrophytocenoses.
For the purpose of organic farming, allelopathy can be an important element in balancing the relationship between density and weeds, pests, diseases and cultivars.
Relationships among the vegetable species and varieties in particular mixed stand are not sufficiently explored, which is a sufficient reason to conduct such a study.

Key words: *organic farming, allelopathy, mixed vegetable crops.*

INTRODUCTION

Mutual interference between plant species in organic agrophytocenoses could be initiated by allelochemicals delivered by the plants in their mixed cropping.
Application of allelopathic interactions in crop protection for controlling populations of weeds, pests, phytopathogens are undeniable.
The allelochemicals applied as pesticides in the organic vegetable systems and their role are studied by Panayotov (1998, 2000), as alternatives for weed and pests control.
There is a little information on plants from different families, crops and weed populations, and on their effects on other plants that can be used for plant protection in organic farming.
There is a need to study and document the relationships among the vegetable species and varieties in a particular mixed vegetation stand.
Such study will enrich the information on the role of biodiversity and allelopathy in technology for organic cultivation of vegetables. The results will allow for drawing conclusions about the benefits of their combinations to provide crops clean from weeds, diseases and pests.
The study, which is described in this paper aims to answer some of these questions.

MATERIALS AND METHODS

The study to establish the relationship between allelopathic interactions among parsley, fennel, onions, carrots and peppers and tomatoes is done in the laboratory of the Department 'Agroecology' in the Agricultural University-Plovdiv during the period 2009-2011 year.
1. Study on effects of extracts from plants on mixed growth and development of seeds of pepper.
The plants select-sources allelochemicels-in the case of parsley, dill, carrots and onions.
In the laboratory of the Department 'Agroecology' in AU-Plovdiv plants were grown for preparation of extracts containing alelochemicals.
The soil (alluvial-meadow) vessels experience is dried to air-dry weight, screened through a sieve with a diameter of 0.5 cm were prepared 12 plastic cups with a volume of 0.5 l, as each of them 10 seeds sown in three repetitions of parsley, dill, onion and carrots. The glasses are placed in the vats, maintain soil moisture by capillary action with a cotton filter. Plants were grown at room temperature and daily cycle of light for twenty-eight days.
Extracts were prepared from roots and vegetation parts of the plants, taking an average sample of 0.5 g or 1 g of roots or mixed

vegetative mass (stems, leaves, flowers). The samples are ground in the mortar, then gradually pouring in 100 or 200 ml of distilled water. The extract were filtered.

Preparation of working concentrations: 1 g of fresh material in 100 ml-1% solution A-25 ml of solution A to 100 ml with H_2O-0.025%; 1 ml of solution A to 100 ml with HO-0.001%

The trials were included in duplicate in parallel with controls (untreated). They were put in a thermostat at 24^0C for 14 days-Petri dishes 6 cm in diameter with 10 number of seeds and 10 ml of extracts with the respective concentration. The parameters monitored were biometric indicators-number of germinated seeds per one Petri dish, root length, surface area and biomass.

2. The vascular trial to identify the effects of extracts of parsley, dill, onion and carrots grown under field conditions on growth of pepper seedlings test.

Extracts were prepared containing allelochemicals from parsley, dill, onion and carrots:

- Parsley-45 g chopped plant parts are flooded with 450 ml. distilled water;
- Carrots-45 g chopped plant parts flooded with 450 ml of distilled water;
- Onions-chopped 15 g plant parts flooded with 150 ml of distilled water;
- Dill-40 g chopped plant parts poured in 400 ml of distilled water.

On each plant pepper and tomato in duplicate and control, in vascular plastic pots having a capacity of 2 kg soil, 50 ml are added twice of the above extracts at the concentrations introduced above.

The biometric identifiers are been measured: plant root length, length of above-ground biomass and fresh and dry biomass in grams.

RESULTS AND DISCUSSIONS

1. Study the effects of extracts from plants on mixed cultivation on the growth and development of seeds of pepper.

The results on the effects of different concentrations of aqueous extracts of carrots, parsley, dill and onion on the growth and development of pepper seeds during the period 2009-2011 are presented in Figures 1 and 2.

The results (Figures 1 and 2) show that the effect of different concentrations on the key length of the root of the pepper seeds was statistically significant ($p < 0.001$). But the combined effect of the concentration and type of culture showed no statistically significant differences in root length ($p > 0.01$). However, it can be reported a decline of this indicator after treatment with 1% solution of carrots and parsley, and the remaining two cultures.

The results (Figure 3 and 4) show that there is significant effect of different concentrations on the length of pepper seedlings ($p < 0.01$), and lowest impact turns out to be the solution with the lowest concentration of allelochemicals. But the combined effect of the concentration and type of culture showed no statistically significant differences in the length of the surface part ($p > 0.01$). However, it can be reported a decline in this indicator after treatment with 1% solution of carrots and parsley, and the remaining two cultures.

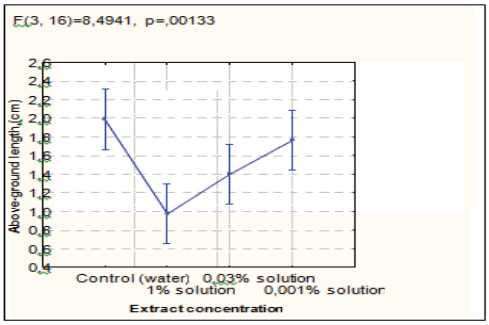

Figure 1. Effect of various concentration of extracts on above-ground length of pepper seeds 2009-2011

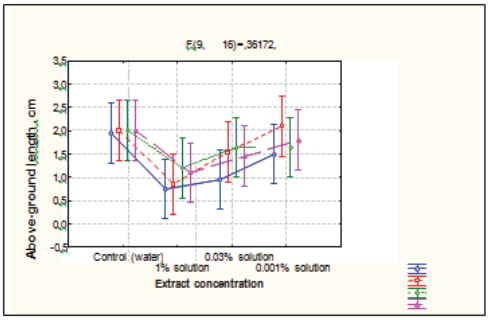

Figure 2. Interactions of extract concentration and type of crop on above-ground length of pepper seeds 2009-2011

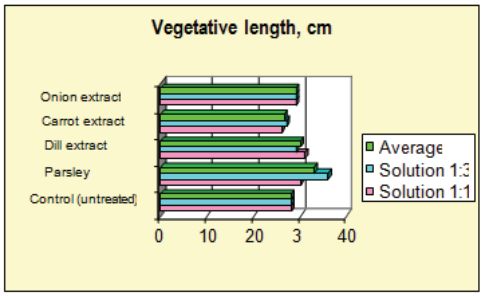

Figure 3. The Allelopathy effect on vegetation length in test plants of pepper

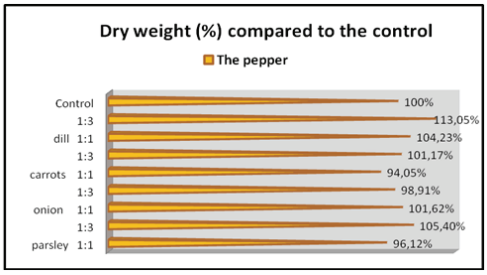

Figure 4. Proportion (%) of dry weight compared to the control dry weight for the vegetative part of the pepper

2. The vascular trial to identify the effects of extracts of parsley, dill, onion and carrots grown under field conditions on growth of pepper seedlings test.

The experiments produced seedlings of pepper plants and response to treatments with extracts of parsley, dill, onion and carrot. It showed the following results (Table 1, taking into account the effect 7 days after treatment with extracts):

Table 1. Vascular Trials – results measured on the 7-th day upon treatment

Pepper (test crop) Vegetative length (cm)			
	Solution 1:1	Solution 1:3	Average
Control (untreated)	28	28	28
Parsley extract	30	36	33
Dill extract	31	29	30
Carrot extract	26	27	26,5
Onion extract	29	29	29

From the results it can be concluded that in both concentrations (dilution 1:1 and 1:3) extracts of parsley impact positive the length of the vegetative part of the pepper (Figure 5). A similar effect was observed after treatment with extracts of fennel, but effect after carrot extract was not observed. The extracts of onion pronounced stimulation effect on pepper compared to the control.

Interesting is the fact that extracts of fennel and carrots, which showed inhibition of total growth and germination of seeds of pepper had a slight stimulation effect here. This could be due to different development environment, i.e. soil media against treatment with water solution that is applied directly to the seeds and that is a single development media).

The results show that variants treated with carrot extract in both solutions (diluted 1:1 and 1:3), the ratio of dry weight compared with the control is lower, respectively-94.05% and 98 91%. The highest percentage is in the treatment with dill extract in a 1:3 dilution-113.05%.

The study of allelopathic relationships and the significance of the results could clarify some expected effects on the interaction of certain vegetable species grown in mixed stands. For example, carrot crop (*Daucus carota* L.), pepper (*Capsicum annuum* L.), dill (*Anethum graveolens* L.) can be grown together to control populations of weeds, pests, phytopathogens so that higher yields could be expected.

The results put many questions concerning the nature and effect of allelochemicals in this experiment. These issues require further research.

CONCLUSIONS

From the study of allelopathic interactions between pepper and allelochemicals extracted from parsley, dill, carrots and onions the following conclusions can be formulated:

The results showed that different concentrations of the tested plant-allelochemicals, i.e. parsley, dill, carrots and onions, applied as extracts affected to a different degree the seed germination, root size and vegetative part for pepper.

The concentration of 1% allelochemicals (seed extract), suppresses in a highest extent the development of the root and stem system.

The inhibitory effect was shown by allelochemicals from onion on the root system on pepper. A positive impact on growth and development of pepper was shown by the extracts of fennel and carrots.

Allelochemicals applied by watering pot experiments with extract solutions had distinct

stimulation effect on the development of the pepper.

It was a stimulation effect shown by the allelochemicals from dill on biometric parameters (fresh and dry weight) of pepper.

ACKNOWLEDGEMENTS

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