

TECHNIQUES OF COMPANION PLANTING FOR IMPROVING FRUIT QUALITY AND THE PROTECTION AGAINST DISEASES AND PESTS IN TOMATO CULTURE

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Abstract:

The crop association in the vegetable gardens should be performed considering the effects they will produce and that some plants deliver higher yields, are tastier and are more resistant to diseases and pests, depending on the plants in their vicinity. Determining the compatibility of the vegetable plants provides a decrease of the diseases attack and a qualitative and more stable production. The association of tomatoes with aromatic herbs, medicinal plants or vegetables pertaining to botanical families indicates the beneficial influence that some species exert in decreasing the pests attack and also the influence on the harvested fruits quality. The attraction of the beneficial fauna due to the presence of flowering plants within the crop and the association with repellent plants may diminish the incidence of pest attack. The presence of aromatic plants like coriander and basil resulted in attracting pollinators and confusing tomato crop specific pests. The presence of peas in catch crop led to a better management of the existing resources in the soil and also provided a production increase of 20%. Use of a large number of vegetables species, aromatic and medicinal flowers created the circumstances of a balanced culture system in which the pests were kept below the harm threshold. This study aims to examine both the inter and intraspecific relations between tomato plants and the associated species, and how they influence the physiological processes and also the yield quality and quantity.

Key words: companion planting, organic agriculture, tomatoes, vegetable species

INTRODUCTION

Applied cultivation practices in vegetable farming influences the quality of the resulting products (Stoian L., 2004).

The agricultural pollution is caused by the irrational usage of synthetic fertilizers when applying cultivation practices.

Since the applied practices can play a high antipollution function, the conducted researches aimed to highlight the benefits of some cultivation practices in vegetable farming in the context of organic farming and the impact of the mixed cultivation of species on yield quality and quantity.

The experiments took place between 2012 and 2013.

MATERIALS AND METHODS

The experimental variants were initiated in the specific pedoclimatic conditions of Olt County, on an area of 720 m² divided in three unheated polyhouses of 240 m² each.

The cultivation practices applied according to the technical specifications were the same for all experimental units as follows:

- Choosing the right crop rotation
- Organic fertilization with green manure
- Ploughing the land at 20 – 30 cm without turning the soil
- Hand hoeing to control weeds

The control of pests and diseases was done using the repellent effect of basil and coriander, or by confusing the pests when planting them with the tomatoes (Bomford M.K., 2004), and by using treatments based on maceration extracts from plants, using Renaud's recipes.

The species used for preparing the treatments were: *Urtica* spp., *Artemisia* spp., *Solanum* spp. in concentration of 12%.

The applied treatments were the same for all experimental units.

The varieties used were:

- Tomatoes: 'Siriana F1', indeterminate growth hybrid made by S.C.D.L. Buzau
- Basil: 'Ruby Red' and 'Aromat de Buzau'
- Coriander: 'Cilandro'
- Parsley: 'Comune 2' and Dill: 'Common'

Variant V1 – Tomato (Control)

The tomato crops were placed on 5 raised beds with the width of 120 cm and 20 cm between the beds serving as space for walking and maintenance. The planting took place on the 10th of April.

Variant V2 – Tomato, Basil, Coriander, Leaf parsley, Peas



Figure 1. Coriander and tomato

The crops were placed on 5 raised beds with the width of 120 cm and 20 cm between the beds serving as space for walking and

maintenance, and on the sides of the polyhouse 40 cm were cultivated with leaf parsley.

Planting and sowing took place in two stages:

In the first stage the peas and parsley were sown on the 15th of February and then the seedlings of tomato, coriander and basil were planted on the 10th of April.

The pea plants around the tomato seedlings inserted in the pea crops were rooted out.

The planting took place using the technical specifications of 40/60 cm, and the distance between plants on a row of 35 cm.

The associated planting of the tomato and coriander seedlings took place as follows: on the odd beds, 1, 3 and 5, there were planted five seedlings of tomato and one seedling of coriander; on the even beds, 2 and 4, the basil was used instead of coriander.

There was no treatment applied when the seedlings of tomato and aromatic herbs were cultivated.

Variant V3 - Peas, Tomato, Basil, Dill

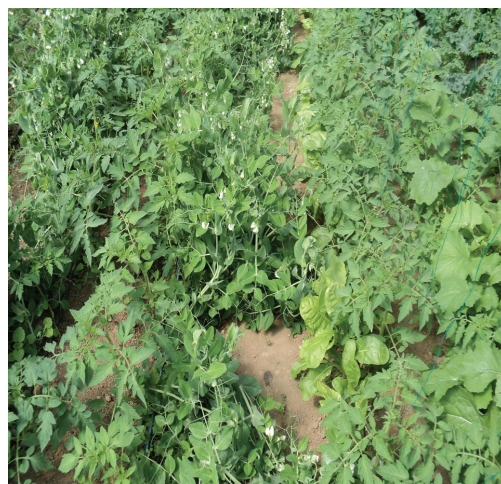


Figure 2. Tomato, peas and basil

The crops were placed on 5 raised beds with the width of 120 cm and 20 cm between the beds serving as space for walking and maintenance, and on the sides of the polyhouse 40 cm were cultivated with dill.

Planting and sowing took place in two stages:

In the first stage the peas were sown on the 15th of February and on the 10th of April, the dill was sown and the seedlings of tomato and basil were planted.

In the case of tomato plants that overlapped the pea's culture, the pea plants were pulled out around the tomato plants. The planting took place using the technical specifications of 40/60 cm, and the distance between plants on a row of 35 cm.

The combination of tomato seedlings with basil took place as follows: a 5:1 ratio was respected, planting for five tomatoes seedlings, one basil seedling.

After harvesting the peas, the resulting biomass was used as follows: 40% was buried in the soil, and the remaining part was used for mulching the soil.

There was no treatment applied when the seedlings of tomato and aromatic herbs were cultivated.

RESULTS AND DISCUSSIONS

The results shown in Table 1 refer to the yield harvested per square meter, from the tomato crops.

Table 1. Tomato yield (kg/m²)

Tomato	V1	V2	V3
'Siriana F1'	6.8	7.37	9.0

Analyzing the obtained data there can be seen the differences between the three applied cultivation practices concerning productivity.

Thus in the variants using crop associations, V2 and V3, were recorded production increases between 8.5% and 20%.

A total of 10 plants randomly chosen from each experimental variant were analyzed to determine the frequency and intensity of tomato blight attack.

There were performed the following examinations to determine the necessary indices for each plant: counting the attacked organs (stem, leaves, flowers, fruits) and the degree of the attack on the organs.

When calculating the intensity of the attack the following formula was used: $I = (i \times f) / n$, the percentage of the results being listed according to the scale of intensity with 6 levels (Calin M., 2005). The results can be seen in table 2.

Table 2. Incidence of diseases and pests per m²

No..	Crop Variant	Disease	
		<i>Phytophthora infestans</i>	<i>Trialeurodes vaporariorum</i>
1.	V1	8%	10%
2.	V2	7%	7.3%
3.	V3	7.8%	8.2%

For determining the organoleptic qualities, a group of ten persons tasted the resulting production from the three experimental units.

The production was sorted out to match in terms of appearance, dimension and degree of maturation.

The test examiners were asked to give a grade from 1 to 5 according to the following three criteria: sugar content, acidity and specific flavor.

As regards the sugar content and specific flavor, the results were insignificant, but 6 out of 10 examiners declared that the tomatoes grown in association with aromatic herbs were less acidic.

On a close inspection of the data from Table 2, there can be seen that the incidence of diseases and pests attack is slightly lower in case of the variants cultivated in association with aromatic herbs and vegetables, in comparison with variant 1 where there was no association of the tomatoes with other plants.

CONCLUSIONS

The recorded data reflects the difference between applied cultivation practices monitoring the production per m², the flavor and the incidence of diseases and pests attack on tomato crops.

Due to the presence of pea in V3 two months before planting the tomato seedlings and therefore to the incorporation of the resulting biomass in the soil, a yield increase of almost 20% was recorded in comparison with the other experimental units.

The difference of production and the decrease of diseases and pests attack in V2 could be accounted for the cultivation of the tomato plants in association with coriander, whose repellent smell played a protective part, and thanks to the flowers a role in attracting the pollinators within the polyhouse.

From a quality point of view, the cultivated variety does not show significant differences about its organoleptic attributes.

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