

## THE INFLUENCE OF PHASE-FERTILIZATION ON STRAWBERRIES GROWN IN DIFFERENT CULTURE SYSTEMS AND IN DIFFERENT DENSITIES

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### Abstract

*Strawberries are among the first fresh fruits that appear on the market from indigenous production. Pedoclimatic conditions in our country allow the cultivation of strawberries in many areas. Oradea is included in the area of favorability. Profitable and quality products of strawberries are possible even with the introduction of modern technologies. In fertilization and irrigation, mulching with different types of foil, placed on the ground or on elevated layers, plays an important role in increasing the quality and quantity of strawberry production.*

**Keywords:** strawberries, fertilization, multiannual culture, mulch

### INTRODUCTION

Among the first fruits appeared on spring on the market, with a flavor and a great taste are the strawberries. In our country the fruits of domestic production appear at the end of April from the protected areas, continuing with the early extra varieties in the field and ending with the late varieties from the last decade of July. Removal varieties are cultivated on smaller surfaces. Mature strawberries have high water content (90%), total soluble substances (10%) and many dietetic components (Hemphill and Martin 1992). From the strawberry leaves, syrups are used to strengthen the gums and cure mouth ulcers, gargle lotions and anti-diarrheic tea used by the Indians of West Washington (Hancock, 1999). Until the 90s, the assortment of varieties is limited to a few varieties, the assortment has now diversified, especially with varieties from other countries, but also some native varieties, the most famous of which is the Premial variety.

Strawberry culture can be difficult or accessible if you follow some important rules in culture technology. Strawberry is not planted after tomatoes, potatoes, peppers and eggplants because these species have *Verticillium* fungi and strawberry (Cepoiu, 2006). After Man (1995) in Romania great damage to strawberry crops is caused by: *Botrytis cinerea*, *Mycosphaerella fragariae*, *Antonomus rubi* and *tetranychus urticae*.

Strawberry is a semi-herbaceous perennial plant growing in the form of a low bush with a specific anatomo-morphological structure that places it in grassy and woody species. The roots of strawberry live in symbiosis with various species of mycorrhiza (Darrow 1966). Strawberry is grown on soils

that require organic and chemical fertilization. The coefficient of use of nutrients in manure in the first year of application is 20-38% of total nitrogen, 16-42% of phosphorus and 28-85% of total potassium.

## **MATERIAL AND METHODS**

In order to achieve the objectives, in the summer of 2016, two monofactorial experiences were mounted at SCDP Oradea. In both experiences the biological material was represented by strawberry variety Clery.

The first experience had nine variants in three repetition. Each variation had a number of 30 plants. Statistical processing of experimental samples was done by variance analysis.

Experimental variants:

V1-Mt (control) unfertilized

V2-fertilized with 0.100 kg / m<sup>2</sup> in one run

V3-fertilized with 0.100 kg / m<sup>2</sup> in two runs

V4-fertilized with 0.150 kg / m<sup>2</sup> in one run

V5-fertilized with 0.150 kg / m<sup>2</sup> in two runs

V6-fertilized with 0.200 kg / m<sup>2</sup> in one run

V7-fertilized with 0.200 kg / m<sup>2</sup> in two runs

V8-fertilized with 0.250 kg / m<sup>2</sup> in one run

V9 - fertilized with 0.250 kg / m<sup>2</sup> in two runs

The fertilization was done with fertilizer Fertilpolina, an organic mixture of pelletized fully humid manure from bovine waste and poultry manure fermented for 7 months. The first fertilization at all variants was done at planting, and in the second half variants, it was done before the flowering. The pedo-climatic conditions of SCDP Oradea are favorable for the strawberry culture.

The second experience had five variants in three repetitions. Each variant had 30 plants. The statistical processing of the experimental data was done by variance analysis. In both experiments the arrangement of the variants and repetitions was done by the subdivisions of the blocks.

Experimental variants in the second experience were:

M1-Mt (control) without mulch

M2 mulched with black foil

M3-mulched with matte white foil

M4-mulched with black foil on raised layer

M5 mulched with matte white foil on raised layer

Density at the surface unit was 60,000 plants/ha in both experiments. In all variations, the irrigation was dripped.

## RESULTS AND DISCUSSIONS

The multi-annual crop of strawberry is most practiced in our country, while the annual crop is sporadic. In the case of this experience, the strawberry culture was set up in 2016 and the harvest was made in the spring of 2017.

Table 1 shows strawberry production on variants (average repetitions). Within strawberry variants, fruit production varied between 10.5 t / ha and 17.5 t / ha. The production of 17.5 t / ha is very good for an early variety, higher yields are characteristic of medium and late baking varieties.

At fertilization with 0.100 kg / m<sup>2</sup> in a half, at the variant V 2 the production increase was 9.52%, but the difference from the control did not exceed the 5% threshold and was not statistically assured. The same amount of fertilizer, but administered in two runs, specific to the third variation, resulted in a production increase of 0.16 kg / m<sup>2</sup> compared to the control.

The difference from this was statistically assured, significantly distinct positive

In variants V4 and V5, Fertipolina was administered in an amount of 0.150 kg / m<sup>2</sup> in one step, or two at V5. In one application there was an increase of 1.8 t / ha, and in the fractional application of 2.9 t / ha compared to the control. The difference from V1 was statistically significantly positive, significantly V4 and V5 significantly. The best results were obtained with the V9 variant, which received a fertilizer of 0,250 kg / m<sup>2</sup>, resulting in an absolute production of 17,5 t / ha and a production increase compared to the control of 66,64%. The difference from this was statistically positive very significantly. Virtually all fertilized variants have achieved production increases compared to the smaller or larger control depending on the amount of fertilizer applied and the mode of application (one or two times).

Table 1

The production of strawberries fertilized with Fertipolina  
SCDP Oradea 2017

Cr. no.	Variant	Absolute production of strawberries kg/m <sup>2</sup>	Relative production of strawberries %	± d kg/m <sup>2</sup>	Significance
1	V1 Mt	1,05	100,00	0,00	-
2	V2	1,15	109,52	+0,10	-
3	V3	1,21	115,23	+0,16	xx
4	V4	1,23	117,14	+0,18	xx
5	V5	1,34	127,61	+0,29	xxx
6	V6	1,41	134,28	+0,36	xxx
7	V7	1,63	155,23	+0,58	xxx
8	V8	1,67	159,04	+0,62	xxx
9	V9	1,75	166,64	+0,70	xxx

LSD<sub>5%</sub>=0,12      LSD<sub>1%</sub>=0,14      LSD<sub>0,1%</sub>=0,20

Table 2

Production of strawberries obtained in different culture systems at  
SCDP Oradea 2017

Cr. no.	Variant	Absolute production of strawberries kg/m <sup>2</sup>	Relative production of strawberries %	± d kg/m <sup>2</sup>	Significance
1	V1 Mt	1,23	100,00	0,00	-
2	V2	1,45	117,88	+0,22	x
3	V3	1,51	122,76	+0,28	xx
4	V4	1,68	136,58	+0,45	xxx
5	V5	1,78	144,71	+0,45	xxx

LSD<sub>5%</sub>=0,14      LSD<sub>1%</sub>=0,23      LSD<sub>0,1%</sub>=0,30

In the second experiment, the results are presented in Table 2. This fertilization was done in two steps with 0.250 kg / m<sup>2</sup> using Fertipolina. Compared with the blank (the non-fermented version), the black-film mulch from V2 produced a productivity gain of 17.88%, the difference from the control was statistically significantly positive.

The matte white foil of the V3 variant improved the production by 0.28 kg / m<sup>2</sup> compared to the unmodified version and by 0.06 kg / m<sup>2</sup> compared to the multicolored black film. The difference from the control was statistically significantly positive. V4 and V5 variants on the raised layer have been shown to be the variants that have recorded the most significant production increases.

Thus, in the case of black foil mulch, the production of strawberries was 4.5 t / ha higher than the control, and in variant V5 mulched with

matted white foil with 0.5 t / ha more or 5.5 t / ha against the witness. In both variants the differences from the control were statistically positive and very significant.

## CONCLUSION

The research carried out at SCDP Oradea on the strawberry culture highlighted some important aspects that can be concluded as follows:

1. Strawberry crop without fertilization can be applied for personal use for family consumption and in no case to profit
2. Fertilization with small amounts of fertilizer does not affect productivity growth. Administration costs are almost the same, but for consistent fattening, profit is much higher
3. Strawberry plants make better use of fertilizer if applied fractionally in just one half. In all variants where fertilization was made in two stages, the production was higher compared to the same amount of fertilizer applied in one half.
4. The increase in strawberry production is directly proportional to the increase in fertilizer yield
5. The best fertilization variant was recorded at V9 where a fertilized Fertipolima fertilizer of 0.250 kg / m<sup>2</sup> was applied in two stages, with an absolute production of 17.5 t / ha
6. Soil mulching in strawberry crops provides a relatively low investment in strawberry production
7. Differences also exist between foil types, matte white foil providing higher microclimate conditions and production with 0.6 t / ha higher than black foil and 1 t / ha in V8 on raised layers
8. The mulched V8 variant with matt white foil disposed on the raised layer recorded the highest absolute production of 17.8 t / ha, 5.5 t / ha more than the untreated control variant.

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