

## STRAWBERRY FIELD CULTURE IN TRANSYLVANIA: PREPLANT, PLANTING AND POSTPLANTING CONSIDERATION ON BLACK PLASTIC MULCH

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**Abstract.** *Fragaria* × *ananassa*, is mostly consumed fresh and in food processing due to its high nutritive value. In order to meet the increasing demand for its fruits, the production practices for this crop have to be improved and also expanded. A field study was carried out during 2017-2018 at Aghires Fabrici, a 35 km from Cluj Napoca city area, in the western part of Romania, to evaluate the growth of strawberries cv. *Albion*, *Darselect* and *Vibrant* in response to the climate. Small plants were transplanted late of September on raised-beds in a completely randomized block design and observed in May. The results revealed that *Albion* plants are less affected by the transplantation process with a 12% of dead plants, followed by *Vibrant* with 18% and *Darselect* with 32%. Also, the vegetative growth showed similarities between the three species, while the capacity of fruiting was double for *Albion* and *Darselect* comparing to *Vibrant*.

**Keywords:** strawberry, field, mulch, plant, postplant

### INTRODUCTION

According to the latest statistics on strawberry production, done in 2016, Romania is the 28<sup>th</sup> country out of the 77 in the world. The top 3 leaders are China, United States of America and Mexico. At the European Union level, the top 3 countries are Spain, Poland and Germany; Romania is the 10<sup>th</sup> production country (FAO, 2018). In Romania, although the total harvested area has dropped from 4500 ha since 1990 to 2724 ha by 2016, the production is increasing summing 23000 t in 2016 compared to 18200 t in 1990 (FAO, 2018). Strawberry production in Romania is achieved in a large percentage in the counties of Satu-Maru and Giurgiu and in a smaller percentage in the counties of Arad, Vâlcea, Gorj, Suceava and Ilfov (Cepoiu N. et al 2006).

For the strawberry crop, irrigation is the main technological link on which the size of the crops and the quality of the fruit depend on. Strawberry is irrigated in all phases of growth and fructification. Multiannual strawberry crops are irrigated through gutters (rigole), sprinklers and less by microsprays. Annual crops are mainly irrigated by drip and secondary by sprinklers and microsprays (Cepoiu N. et al 2006).

Strawberry mulching is done in order to: protect plants against frosts, preserve fruit quality, control weeds, and obtain earlier fruit productions. Usual mulch materials used for the strawberry crop include a layer of straw or the black polyethylene foil (Cepoiu N. et al 2006).

Varieties like *Premial*, *Redgauntlet*, *Dana* and *Elsanta* are widely cultivated in Romania. The *Honeoye* variety ensures early production. Medium varieties are *Elsanta* or *Pegasus*. For a late production the *Matis* variety is recommended. The *Albion* variety produces from May to October (Stiri Agricole, 2015). Strawberries is one of the first fruits available on the Romanian market (Cepoiu N. et al 2006), and are common and important fruits used in the human diet due to their high content of essential nutrients (F. Giampieri et al., 2012). Strawberries are economically important and generally consumed fresh or in

processed forms, such as jams, juices (F. Giampieri et al.,2012), jellies, wines, yoghurt, cakes, ice cream, flavored milk, smoothies and cereal bars. Strawberry leaves are used to prepare syrups to strengthen the gums and heal ulcers in the mouth, gargle lotions and antidiarrheal tea (Cepoiu N. et al 2006).

A diet rich in fruits like berries, including strawberries, is often associated with a lower incidence of obesity, infections, cardiovascular and neurologic diseases, and cancer (F. Giampieri et al.,2012).

## MATERIAL AND METHOD

The research was carried out at Aghiresu, Cluj county. In late August the soil was fertilized and plowed. Right after these actions, the soil was mounded into plateau rows and covered with black plastic as mulch. Also, when the plastic was laid, drip tape irrigation was simultaneously placed in the ground. Plants were transplanted in late September 2017 and grown in rows 80 cm apart. Intra-row distance between plants was 30 cm. The experiment consisted of following factors:

- Specie Vibrant, Irrigation I1, Fertilizer F1 (S111F1)
- Specie Vibrant, Irrigation I1, Fertilizer F2 (S111F2)
- Specie Vibrant, Irrigation I2, Fertilizer F1 (S112F1)
- Specie Vibrant, Irrigation I2, Fertilizer F2 (S112F2)
- Specie Darselect, Irrigation I1, Fertilizer F1 (S211F1)
- Specie Darselect, Irrigation I1, Fertilizer F2 (S211F2)
- Specie Darselect, Irrigation I2, Fertilizer F1 (S212F1)
- Specie Darselect, Irrigation I2, Fertilizer F2 (S212F2)
- Specie Albion, Irrigation I1, Fertilizer F1 (S311F1)
- Specie Albion, Irrigation I1, Fertilizer F2 (S311F2)
- Specie Albion, Irrigation I2, Fertilizer F1 (S312F1)
- Specie Albion, Irrigation I2, Fertilizer F2 (S312F2)

The observations were aimed to establish species differences regarding primary results: vivid plants after transplantation, number of inflorescences and number of leaves. Treatments were replicated three times in a completely randomized block design. Observations were recorded on twelve plants from each replication in May 2018. The biological material used for this study is represented by 3 species of strawberries: *Vibrant*, *Darselect* and *Albion*.

*Fragaria Xannanassa Duch.* plant, has been denominated '*Darselect*' for purposes of international recognition. The variety of strawberry was created by crossing female parent '*Elsanta*' and male parent '*Parker*'. The variety was grown and asexually reproduced by runners and micropropagation. The combination of characteristics reflects the novelty of this plant and of its potentially advantageous use in the production of commercial strawberry fruit as well as in planned breeding programs for the development of further superior varieties. Among the characteristics which distinguish the variety from other varieties, are a combination of traits which include vigorous growth habit, good rooting capacity, large conical fruit with firm skin, early ripening and long harvest time. The strawberry plant '*Darselect*' is a short day responsive plant. The variety is closest to the variety '*Elsanta*', but is distinguished therefrom by producing a more erect plant, longer petioles, larger fruit and more homogenous skin color than '*Elsanta*'.

The variety denomination '*Albion*', is originated from a cross performed in 1997 between the cultivar '*Diamante*' and advanced selection Cal 94.16-1. '*Albion*' was first

fruited at the University of California Wolfskill Experimental Orchard, near Winters, Calif. in 1998, where it was selected, originally designated Cal 97.117-3, and propagated asexually by runners.. The properties of this variety were found to be transmissible by such asexual reproduction. ‘*Albion*’ is typical of day-neutral strawberry cultivars and produces fruit regardless of day length when treated appropriately in arid, subtropical climates. Each primary flower has 5-8 petals. The relative position of the inflorescence to the leaves is exposed, or above the foliage. The fruit shape for ‘*Albion*’ can vary but is typically a long and symmetrical conic, and is easily distinguished from other specie. It usually has a great proportion of symmetrical fruit. The mean number of achenes per berry is 440.8 (range of 330-548). The average berry weight is 33 grams. It is possible that the phenotype may vary somewhat with variations in the environment. Phenotypic features may also vary depending on culture conditions. Initiation of flowering depends on the weather. It may occur as little as 6 week after planting and is typically around 3 to 4 months (February 1 to March 20). Termination of flowering is temperature dependent and day-length independent for this cultivar. From flowering to ripe fruit takes as long as 7 weeks in the short days and cool temperatures of winter, as little as 3 weeks in summer. First fruit is typically available April 1-May 15 for this example. Subjectively, ‘*Albion*’ has outstanding flavor. The fruit will be exceptional for both fresh market and processing, and will be useful for home garden purposes.

‘*Vibrant*’ previously trialled as EM1119, has a season that is approximately 7 days earlier than ‘*Elsanta*’ in maincrop and has a longer harvesting season than ‘*Elsanta*’ from a 60-day plant. In trials, the average yield in the maincrop season has been approximately 85% of ‘*Elsanta*’, but with a higher proportion of large berries (>35 mm). Plants of ‘*Vibrant*’ have moderate vigour with an erect habit and the flowers are held above the foliage on long peduncles, resulting in a very good fruit display and rapid harvesting. Berries are glossy with a strong red colour and very regular conical shape. The flavour is sweet with a pleasant juicy texture, while mean Brix readings and shelf life are both similar to ‘*Elsanta*’. ‘*Vibrant*’ has good resistance to powdery mildew (*P. aphanis*) but is moderately susceptible to wilt (*V. dahliae*). Although ‘*Vibrant*’ is a short-day cultivar, in the UK it will produce a second crop of fruit, although the timing and magnitude of this depends on the season, location and growing system. If grown without protection , the first crop typically begins harvesting in late May or early June, a second flush of flowers appears in August and the second harvest begins in September. The magnitude of the second crop varies between seasons but would usually be in the range 15-30% of the first crop.

## RESULTS AND DISCUSSION

The observations reveald that only 12% of *Albion* plants died due to transplantation the runners in late September, 2017. More affected to the process was *Vibrant*, with 18% of dead plants, and most affected was *Darselect*, with 32% of dead plants.



Figure 1. Plateau rows of the strawberry field

Figure 2. Drip tape irrigation system



Figure 3. Black plastic mulch

Most responsible for the vivid plants was, definitely, the weather conditions. Figure 4 and Figure 5 show both the temperatures and precipitations for the studied area. September 2017, the month the strawberries were planted, had precipitations: 91 mm, mean daily maximum: 21°C, and mean daily minimum: 13°C (Fig.1). May, 2018, the month the observations were made had precipitations: 28 mm, mean daily maximum: 22°C, and mean daily minimum: 8°C (Fig.2).

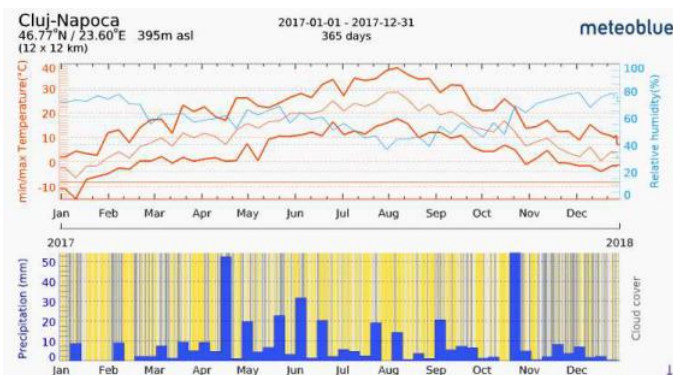


Figure 4. Temperatures and precipitations 2017, Cluj Napoca  
Source: <https://www.meteoblue.com>

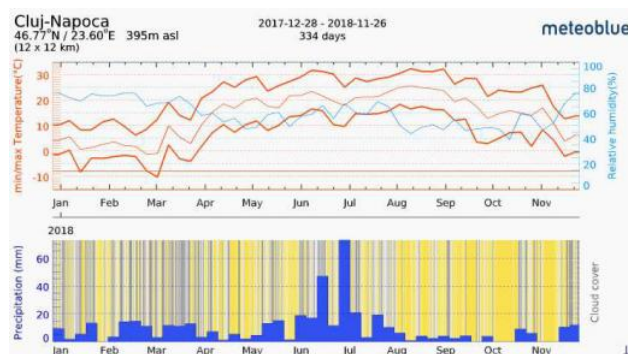


Figure 2. Temperatures and precipitations 2018, Cluj Napoca  
Source: <https://www.meteoblue.com>

Regarding the vegetative growth, the number of leaves per plant was very close for all three species as shown in Figure 6 (*Vibrant* and *Darsalect* with 4, *Albion* with 5). On the

other hand, the number of inflorescences showed differences between the studied species. It strongly suggested *Vibrant*, with 1,65 inflorescences/plant, to be the specie with half the inflorescences present on the other two observed species of strawberries (Fig.7).

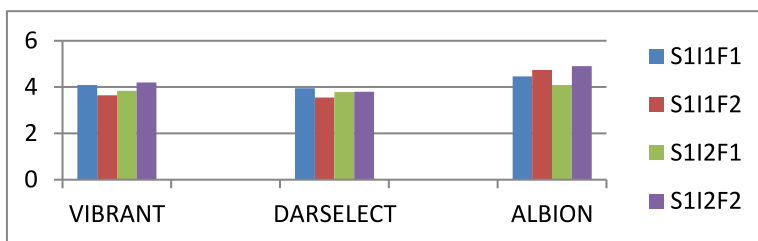


Figure 6. Number of leaves of the three studied species of strawberry

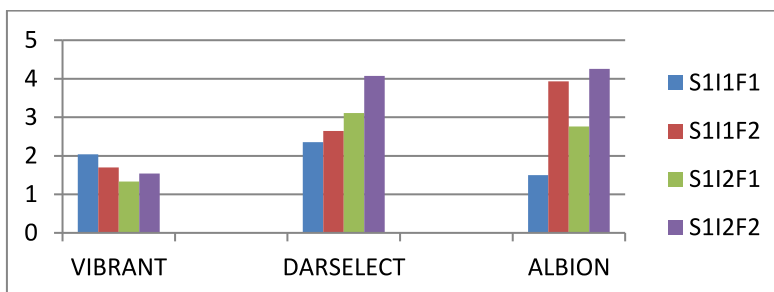


Figure 7. Number of inflorescences of the three studied species of strawberry

## CONCLUSIONS

The results presented herein allow distinguishing how related species of strawberries planted in field respond to climate conditions in Transylvania, Romania, Latitudine : 46.866878, Longitudine : 23.270057. All studied species were planted at the same time, used the same black plastic mulch, had the same conditions of growing. Although the vegetative growth showed similarities between the three species, the capacity of fruiting was double for *Albion* and *Darselect* comparing to *Vibrant*. Also to be noted that *Darselect* was very sensitive to transplantation process given the climate with an average of 10 days of rainy days on September, the month of transplantation.

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