

## THE INFLUENCE OF CULTURE ON HOW TO SET UP EARLINESS AND PRODUCTION OF CHARD

Cărbunar Mihai\*, Popovici Mariana\*, Silagy Dorin

\*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail:carbunar@yahoo.com

### **Abstract**

*The chard is part of the green vegetables. It is cultivated for its leaves and for its stalks, it is of different sizes and colors. In many countries it is used since ancient times for its medicinal properties. In our country it is cultivated on smaller and reduced areas, many times being a surrogate of the spinach during summer. A chard culture can be set up through direct sowing or through seedlings.*

**Key words:** chard, stalks, seedling

### **INTRODUCTION**

Cultivated both for its leaves as well as for the thickness of the stalk, the chard adds to the richness of minerals and vitamins existent in the green vegetables. The young leaves can be used raw in salads; as the plant grows older, the bitter taste becomes more evident, but it vanishes if the plant is cooked, becoming more delicate than the one of the cooked spinach. The chard belongs to the group of green vegetables and it is a plant less cultivated than other plants from the same group (green salad, spinach), but it has the same great importance as the other green vegetables. The chard (*Beta vulgaris* subspecies *cicla*) is sometimes called the beet stalk due to its large, big and flat stalks. (Pyo et al., 2004).

As we have mentioned before the chard can be eaten raw but also cooked in different ways, and lately it is more and more cultivated as an ornamental plant, due to its contrast of colors (white, yellow, green, red, purple). The chemical composition has been searched, mainly the nutritious qualities of the different types of *Beta vulgaris* subspecies *cicla* types of chard in order to discover the biological activities of the plant related to its anti cancer, anti diabetic and anti oxidant properties. (Ninfali et al., 2007; Ninfali and Angelino, 2013; Pyo et al., 2004; Sacan and Yanardag, 2010; Gil and co., 1998; Bozokalfa et al., 2011; Tomas-Callejas et al., 2011; Pokluda and Kuben, 2002; Gennari et al., 2011; Santos et al., 2014; Yanardag and Colak, 1998; Bolkent et al., 2000; Ninfali and Bacchiocca, 2003). In comparison with other largely consumed vegetables that are part of the Mediterranean diet, the chard presents a great anti oxidant activity (Bolken

et al., 2000).

In Turkey, in popular medicine, the chard is used as an anti diabetes agent. One of the studies related to the hypoglycemic properties (Yanardag and Colak, 1998) of the chard has shown that, a dose of 2-8g out of a kilogram of watery extract from dried leaves of chard has led to a decrease of the glucose from the blood of rabbits with alloxan induced diabetes, but the methanol extract from the same plant did not do the same thing.

On planet Earth, chard is cultivated on huge areas in the USA, Japan and India and in what the European Union is concerned, the main producers are: Italy, France, and Spain. In our country chard is less known and it is mostly cultivated in the south part of Transilvania, by amateurs, especially they cultivate the chard for its leaves and less for its stalks. It can be usually be found on the markets during summer when other green vegetables are less to be found. Many times it is sold under the name of spinach.

The beet for stalk has got requests resembling other types of beet. It prefers deep, rich in humus types of soil, with a good capacity to retain water. According to the data presented by A. Anstett, for a ton of harvested product, in a summer culture, the plants extract from the soil the following: 1,9 kg N, 0,9 kg P<sub>2</sub>O<sub>5</sub>, 6,1 kg K<sub>2</sub>O, 1,9 kg NaO și 0,4 kg MgO.

#### **MATERIAL AND METHOD**

The experience related to the chard has taken place in 2016, in Bihor county, in Săcuieni locality, in a private micro farm, where on a surface of 500 square metres an experimental field has been organized.

The soil and weather conditions are extremely favorable. The average annual temperature is of 10,2°C with cold winters and moderate summers.

The average annual quantity of rainfall has values of 615,2 mm, distributed irregularly and with torrential character, the poorest period of rainfall being in August October, allowing a corresponding harvesting. The period with the richest rainfall is during the winter months, when a serious water reserve is created into the soil, as well as in March, and June. The soil the experimental field is placed on is clay – sandy on a pedological level of aluvisoil.

The monofactorial experience has been organised after the method of the sub divided blocks, with 14 variants in three repetitions. Each variant has had 10 plants. The biological material has been represented by 7 types of chard: VERTE A CARDE BLANCHE 3, COULEURS "RAINBOW, CHARLOTTE, LISCIA VERDE DA TAGLIO, BRIGHT YELLOW, LUCULLUS, CARDE BLANCHE AMPUIS. The witness has been

represented by the average of the experience. The processing of the experimental data has been performed through the analysis of the variant.

## RESULTS AND DISCUSSION

The chard is a species of vegetable which is cultivated especially in open field but also in protected areas, but in this case on much smaller surfaces. In open fields, the chard is cultivated in spring, in summer cultures, in autumn cultures and in winter cultures.

The early culture in the field is done with seedlings produced in heated and protected areas as well as through direct sowing. The aim of the research is to establish the way the chard behaves if it is planted through direct sowing or if it is planted through seedlings. The objectives had in view the early types of chard planted through the two methods, the growth and development of the chard plants, establishing the quality and quantity of the production for each type of chard and for each method of cultivation.

The preliminary plant has been a autumn culture of cabbage. The preparation of the field and of the other technological segments have been unfolded according to the general technology of chard cultivation, giving a great importance to the phasal fertilization. In this way, in order to stimulate the growth of the leaves, Ciofu and co., 2003 recommend that during the phase fertilization huge quantities of nitrogen be applied. According to the research objectives, the realization of the culture has been done through seedlings and through direct sowing. For the production of the seedlings we have sowed in a double protected greenhouse, in pots of 7x7x8, in the middle of March, and the direct planting in the field has been done in the first decade of May. The direct sowing in the field has been done in the last decade of April ( thus avoiding the vernalization of the plants).

Until harvesting we have followed the evolution of the leaf 's mignonette's development for each type of chard and for the system of culture set up. In the case of the culture set up through seedlings, after the plants having actually been planted, a short period of vegetation stagnation has been noticed, but then, after a few days, the vegetation has continued its physiological processes with maximum efficiency.

The first stalk productions have been harvested starting with the first decade of July. The first harvested stalks represented the early production, the production data and their statistic processing are presented in table 1. For each type of chard we have gathered the production data both for the plots set up through direct sowing (DS) as well as for the plants set up through seedling (S).

An assembly analysis of the early stalk production shows that, in comparison with the average of the experience, some types of chard have registered productions superior to the witness, other types of chard have had belated productions. In absolute early production, the highest quantity of harvested stalks have been at the Couleurs Rainbow type of chard, a variant set up through seedling, with an increase of an early production of 66.66% in comparison with the witness, a very significantly positively and statistically ensured difference. With a production of over 40 t/ha we also had the seedling variant of Verte a Carde Blanche 3 type of chard, the difference towards the witness having been very significantly, positively and statistically ensured. Other variants which have overpassed the production of the witness, regardless of the fact that they were set up through seedlings or through direct sowing, have been the following: Verte a Carde Blanche 3, Luculus R, Couleurs Rainbow S and, with a lower production Luculus S, with a difference towards the witness of 0,4 kg/m<sup>2</sup>, difference which was distinctively significantly positively and statistically ensured. The other variants have registered early productions under the average level of the experience. The direct sowing variant of the Charlotte type of chard has obtained the lowest productions of stalks, of only 31,80% from the average of the experience. The difference towards the witness has been very significantly statistically negatively ensured. The types of chard: Bright Yellow R and S Liscia Verde Da Taglio S, Charlotte R, Carde Blanche Ampuis R have had early productions lower than the average of the experience, the differences being very significantly statistically negatively ensured and significantly distinctively negatively ensured, respectively. The Carde Blanche Ampuis S and Liscia Verde Da Taglio R variants have had an earliness very close to the average of the experience, their differences towards the witness did not overpass the P=5% level. In this way one can notice that, except for the Carde Blanche Ampuis type of chard, for all the other types of chard the early production of stalks has been higher at the variants set up through seedlings in comparison with the variants set up through direct sowing. At the Carde Blanche Ampuis type of chard the situation was vice versa(table1).

*Table 1*

Early production of chard stalks and leaves  
Săcuieni 2016

Cr. no.	Variant	Absolute production of stalks kg/m <sup>2</sup>	Relative production of stalks %	± d kg/m <sup>2</sup>	Significance
1	CARDE BLANCHE AMPUIS <b>S</b>	2,65	101,53	+0,04	-
2	CARDE BLANCHE AMPUIS <b>R</b>	2,20	84,24	-0,41	00
3	BRIGHT YELLOW <b>S</b>	1,59	60,91	-1,02	000
4	BRIGHT YELLOW <b>R</b>	2,14	81,99	-0,47	00
5	LISCIA VERDE DA TAGLIO <b>S</b>	1,75	67,04	-0,86	000
6	LISCIA VERDE DA TAGLIO <b>R</b>	2,41	92,33	-0,20	-
7	CHARLOTTE <b>S</b>	0,83	31,80	-1,78	000
8	CHARLOTTE <b>R</b>	1,63	62,45	-0,18	000
9	VERTE A CARDE BLANCHE <b>3 S</b>	3,19	122,22	+0,58	xxx
10	VERTE A CARDE BLANCHE <b>3 R</b>	4,10	157,08	+1,49	xxx
11	LUCULLUS <b>S</b>	3,01	115,32	+0,40	xx
12	LUCULLUS <b>R</b>	3,39	129,88	+0,78	xxx
13	COULEURS "RAINBOW" <b>S</b>	3,40	130,26	+0,79	xxx
14	COULEURS "RAINBOW" <b>R</b>	4,35	166,66	+1,74	xxx
15	AVERAGE Mt.	2,61	100,00	0,00	-

LSD<sub>5%</sub>=0,31 LSD<sub>1%</sub>=0,39 LSD<sub>0,1%</sub>=0,52

In the case of chard the stalks are harvested until autumn. In what the current study is concerned, the total quantity of stalks harvested at all the types of chard set up through the two methods have been statistically registered and processed in table number 2. If we have an assembly analysis of the capacity of production of the types of chard taken into study, we find out a very big capacity of production for some types of chard and a very little capacity of production for other types of chard. The specialty literature mentions high productions of chard, of 40-50 tons per hectare, the average production in what the current study is concerned being of 64t/ha. If, in the early productions the majority of the types of chard set up through seedling have registered productions superior to their variants which were set up through direct sowing (the same type of chard), in the case of the total production, the variants set up through direct sowing of the Luculus, Verde

A Carde Blanche 3, Liscia Verde Da Taglio and Carde Blanche Ampius types of chard, have had higher quantities of stalks than the variants set up through seedlings. The lowest quantity of stalks has been harvested from the Charlotte S type of chard, being of 3,66 kg/m<sup>2</sup> and representing 57,09% from the production of the witness, the difference from this being very significantly positively statistically ensured. With an absolute production of 93,7 t/ha, the Couleurs Rainbow chard type variant set up through seedling has registered the highest stalk production. The difference in comparison with the average Blanche 3, Luculus and Couleurs Rainbow. All the other variants have had total productions under the average level of the experience. An exception was the type Carde Blanche Ampuis S, set up through direct sowing whose total production of stalk was exactly the average of the experience (6,41kg/ m<sup>2</sup>)(Table 2).

Table 2

Total production of chard stalks and leaves  
Săcuieni 2016

Cr. no.	Variant	Absolute production of stalks kg/m <sup>2</sup>	Relative production of stalks %	± d kg/m <sup>2</sup>	Significance
1	CARDE BLANCHE AMPUIS S	6,41	100,00	0,00	-
2	CARDE BLANCHE AMPUIS R	5,54	86,42	-0,87	0
3	BRIGHT YELLOW S	4,42	68,95	-1,99	000
4	BRIGHT YELLOW R	5,40	84,24	-1,01	00
5	LISCIA VERDE DA TAGLIO S	5,23	81,59	-1,18	00
6	LISCIA VERDE DA TAGLIO R	4,58	71,45	-1,83	000
7	CHARLOTTE S	3,66	57,09	-2,75	000
8	CHARLOTTE R	5,27	82,21	-1,14	00
9	VERTE A CARDE BLANCHE 3 S	7,38	115,12	+0,97	x
10	VERTE A CARDE BLANCH 3 R	6,82	106,39	+0,41	-
11	LUCULLUS S	8,79	137,12	+2,31	xxx
12	LUCULLUS R	8,03	125,27	+1,62	xxx
13	COULEURS "RAINBOW S	8,95	139,62	+2,54	xxx
14	COULEURS "RAINBOW R	9,37	146,17	+2,96	xxx
15	MEDIA Mt.	6,41	100,00	0,00	-

LSD<sub>5%</sub> = 0,76

LSD<sub>1%</sub> = 1,01

LSD<sub>0,1%</sub> = 1,35

## CONCLUSIONS

Research related to the influence of the chard culture set up upon the earliness and productivity for some types of chard plants have allowed the issue of certain conclusions.

1. Chard contributes to the diversification of green vegetables during summer when usually green vegetables are hardly to be found on the market.

2. The production potential of the chosen types of chard corresponds to the high level of culture profitable degree.

3. Important productions of early chard are obtained by setting up cultures through seedlings, an exception being the Carde Blanche Ampuis type of chard, which behaves better if planted through direct sowing.

4. The highest early stalk production has been harvested at the Couleurs Rainbow type of chard, being of 43,5 t/ha.

5. The following chard types: CARDE BLANCHE AMPUIS, LISCIAVERTE DA TAGLIO, VERTE CRDE BLANCHE 3 and LUCULUS, set up through direct sowing have had total superior productions in comparison with the variants of the same chard types planted through seedlings.

6. The quantity of 93,7 t/ha, realized by the Couleurs Rainbow type of chard reveals a very high production, while the Charlotte type, set up through direct sowing, has realized little over 36 t/ha.

7. Due to the white, yellow, red and purple colored stalks, the chosen types of chard can easily become part of landscaping.

#### **Acknowledgement**

This paper was supported by the project - Increasing the competitiveness of the didactic station of University of Oradea, project code CNFIS - FDI - 2016 - 0036, project founded in the frame of the call Institutional Development Found - FDI 2016

#### **REFERENCES**

1. Apahideanu al. S., Maria Apahideanu – 2001 Legumicultură specială. Editura Academic Pres, Cluj-Napoca
2. Căzăceanu I., Georgescu, m., Zavoi A., 1982 – Ameliorarea plantelor Horticole și tehnică experimentală. Editura Didactică și Pedagogică, București.
3. Cantliffe, D.J., S.C. Phantac, 1974 „ Nitrate acumulation in greenhouse vegetable crops.”. Canadian Journal of Plant Science, vol.54, p. 783-788.
4. Ciofu Ruxandra și colab., 2004, Tratat de legumicultură, Ed. Ceres, București, 2004
5. Choux CI., Foury CI., 1994, Productions legumieres vol. I-III, Lavoisier, TEC/DOC, Paris
6. Davidescu D., Velicica Davidescu, 1992 – Agrochimia Horticolă. Editura Academiei,

București

7. Dumitrescu M. și colab., 1998 – Producerea legumelor. Editura Ceres, București.
8. Horgoș A., 1999 – Legumicultură specială. Editura Mirton, Timișoara.
9. Indrea D. și colab. – Legumicultură. Editura Didactică și Pedagogică, București 1983
10. Lăzureanu A. Și colab., 1998 – Agrotehnică. Editura Risoprint, Cluj –Napoca.
11. Maier I., 1969 – Culutra legumelor. Editura Agro-silvică, București.
12. Palageșiu I. și colab. – 2000, Entomologie agricolă și horticolă. Editura Mirton, Timișoara.
13. Popescu Gh. – 2001 Patologia plantelor horticole. Editura Eurobit, Timișoara.
14. Popescu V. – 1996 – Legumicultură. Vol.I. Editura Ceres, București.
15. Popescu V., Horgoș A. – 2003 – Tratat de legumicultură. Editura Ceres, București.
16. Stan T. N., Stan N. T. – 1999 – Legumicultură, Vol.I., Editura Ion Ionescu de la Brad, Iași.
17. Victor Renaud et Ch.Duduet. 1988 –Le potager par les methodes naturelles.
18. Voican V. – 1972 – Efectul intensității luminii asupra creșterii și dezvoltării asupra unor specii legumicole.
19. Anuarul F.A.O. – 2006.
20. <https://ro.wikipedia.org/wiki/Mangold>
21. [https://fr.wikipedia.org/wiki/Blette\\_\(plante\)](https://fr.wikipedia.org/wiki/Blette_(plante))
22. [msanatare.bzi.ro/10-motive-pentru-a-manca-mangold-56839](https://msanatare.bzi.ro/10-motive-pentru-a-manca-mangold-56839)