INFLUENCE OF PHASIAL FERTILIZATION ON PETIOLES YIELD IN SWISS CHARDS CROP IN ECOLOGICAL SYSTEM

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Abstract

The swiss chards is part of the green vegetables. It is a less spread vegetable in Romania, being cultivated for its leaves and its stalks. The stalks and the leaves contain a series of vitamins and minerals very useful for the human body. The stage fertilization of the culture has got a direct influence upon the production as well as upon its quality.

Key words: swiss chards, ecological culture, stage fertilization

INTRODUCTION

The swiss chards is part of the green vegetables; as V Ciocîrlan puts it, the species of this group are part of five botanical families: Compositae, Chenopodiaceae(spinach, orache, beet for the leaves and the stalks of the swiss chards),Umbeliferae, Tetragoniaceae, Valerianaceae.

Being part of the same family as the spinach, the swiss chards has got a chemical composition close to it, being consumed and cooked as the spinach. In some agricultural markets from Romania, some producers write on the tag ”spinach”.

The swiss chards is originally from the area of the Mediteraneean Sea, having at origin three subspecies of the Beta type, meaning: cicla, maritima and vulgaris. It has been cultivated since antiquity with the name of Beta, being mentioned by many writers from antiquity, including Plinius the Old.

If in Romania is quite less cultivated, especially by amateurs from the south of Transylvania, in the U.S.A. , Japan and India it is cultivated on huge areas. In Europe, there are three big producers of swiss chards, Italy with 4000 ha in the field and 250 ha in protected areas, France, with an annual production of 12090 tons (Agreste 2011), especially in the south-east part and Spain with 1200 ha and an average production of 40tons/ha.

The swiss chards is cultivated for its leaves and for its stalks, but the stalks present a great interest for the consumers. A study from 2006 has found out that these nerviers with shiny shades are in fact important quantities of gluten, a kind of aminoacid which plays an essential role in the healing and recovery of the human body. The swiss chards has got the same nutritious content as the spinach, being an important source of beta caroten and of vitamins together with a series of mineral salts. It has got a low

content of calories: 100 g of swiss chards leaves furnish the human body only 20 kilocalories.

Recent research has shown that the swiss chards has got at least 13 different anti oxidants, policarbolic, heart protectiong flavonoids and siringic acid.

The swiss chards' leaves are an excellent food for those who lack potassium, calcium, phosphorus, and iron. The stalks are recommended to those who need sodium and potassium. Due to its high content of potassium, it favorizes the release of water from the body and it is also an ideal food that keeps the blood pressure under control.

According to some studies, a unique advantage brought by this plant is its capacity to help the liver cells regenerate themselves. As well as other vegetables from the green ones the swiss chards is an excellent source of calcium which helps to strenghten bones and teeth. The swiss chards is rich in biotine, an important vitamin for the hair, determining its growth and resistance. A cup of swiss chards contains 9276 μg of luteine, an essential anti oxidant for the health of the eyes.

Unfortunately, like the spinach, the swiss chards also contains oxalic acid, and as a consequence, people who have stomach disorder must eat this plant moderately. If the swiss chards culture is applied a non corresponding agricultural technique, especially an exagerated fertilization, that can negatively influence the quality of the product. The introduction of the culture into the ecological production system represents the warrant of a superior quality.

MATERIAL AND METHOD

The mono factorial experience has been performed in 2014 in a micro ecological vegetable greenhouse in the north-west of Romania. The experiment has got 9 experimental variants in 3 repetitions, each variant has had 40 plants of swiss chards. The experimental variants have been placed after the method of the sub divided blocks. The biological material has been represented by the Verte a Carde Blanches type.

Experimental variants

V_1Mt – only basic fertilization with 20t/ha manure

V_2 – soak of poultry manure (1) – on the soil

V_3 – Tecamin Max (1) – in foil

V_4 – Orga 3 (1) – on the soil

V_5 - Orga 3 (1) – on the soil; Agriful (1) – on the soil; Tecamin Max (1) – in foil

V_6 – soak of poultry manure (1) – on soil; Agriful (1) – on soil; Tecamin Max (1) – in foil

V_7 - soak of poultry (1) – on soil; Agriful (1) – on soil; Orga 3 (1) – on soil

V_8 - Tecamin Max (1) – in foil; Tecamin Brix (1) – in foil

V_9 - soak of poultry manure (1) – on soil; Orga 3 (1) – on soil; Agriful (1) – on soil; Tecamin Max (1) – in foil; Tecamin Brix (1) – in foil

( ) – Number of applications

RESULTS AND DISCUSSIONS

The experimental culture has been established in the spring of the year 2014. Previously, in autumn, the field had been fertilized with 20t/ha manure, half fermented, manure which came from an extensive exploitation. The culture has been realized by direct sowing at the half of April, according to the experience layout.Victor Renaud and Ch. Dudouet recommend sowing in a decreasing month.

The applied culture technology has been that of the swiss chards în the ecological culture, with modifications related to the stage fertilization (having în view the experience).

In the conventional technology, for a stage fertilization, Ciofu and co. (2003) recommend high quantities of fertilizers with nitrogen. În the ecological technology, according to the EU regulation no. 834/2007 and according to the E.U regulation no. 889/2008, nitrogen fertilizers are restricted to 170 kg N/ha/year and only organic nitrogen is allowed to be used.

Harvesting began at the beginning of July and ended at the end of October. Harvesting was done on variants and on repetitions, the average yield being registered in table 1.

Table 1

The Yield of the swiss chards petioles

Nr.crt.	Variant	Absolute Yield kg/m^2	Relative Yield %	±d Kg/m^2	Significance
1	V1Mt	2.15	100	0.00	-
2	V2	2.53	117.67	+0.38	xx
3	V3	2.27	105.58	+0.12	-
4	V4	2.41	112.09	+0.26	x
5	V5	2.82	131.16	+0.76	xxx
6	V6	3.68	171.16	+1.53	xxx
7	V7	3.79	176.27	+1.63	xxx
8	V8	2.56	119.06	+0.41	xx
9	V9	4.12	191.62	+1.97	xxx

LSD 5 % = 0,.5 LSD1 % = 0,1 LSD 0.1% =0.45

The processing of the yield data from table 1 has been done through the analysis of the variants. In comparison with the witness, to which no stage fertilization has been applied, all the variants have registered high productions. The only variant in which the difference did not overpass the p = 5% limit, not being statistically ensured, fertilized extra radiculary with Tecamin Max – one application. With an absolute production of over 40t/ha, the V_9 variant has registered the highest production increase in comparison with the witness (91,62 %). The difference towards this one has been very significantly positively statistically ensured. In the case of fertilization with three products and only on the soil, (variant V_7) the stalk production was quite high, with 1,63 kg/m^2 higher than in the case of variant V_1, the difference being very significantly and positively statistically ensured. In the case of variant V_8, fertilized only with foil kind of fertlizers, the production increase in comparison to the witness was a bit lower, of only 19,06 % the difference being significantly positively statistically ensured. The stalk production în the case of variant V_3 has been only with 2,6 t/ha higher than at the V_1, the difference towards it being significantly positively and statistically ensured. Variants V_5 and V_6 emphasized themselves with important production increases, between 31% and 71% in comparison with the witness, the difference for both variants having been very significantly, positively and statistically ensured.

The aspect which borders the ecological agriculture from the conventional one is the quality of the finite product. In order to have a clear image of the different variants of stage fertilizations of the ecological swiss chards' culture, the stalk production from each variant and from each repetition has been distributed on three stairs of quality. The quality stairs are: extra quality, 1st quality and 2nd quality and for each of these, the percentage has been expressed as well as the production in kg/square meters. All the data are presented in table number 2.

Table 2

The quality of the swiss chards petioles

Nr crt.	Varianta	Producţia Totală Kg/m^2	Cal.extra din total		Cal.I din total		Cal. II din total	
			Kg/m^2	%	Kg/m^2	%	Kg/m^2	%
1	V1 Mt.	2.15	1.04	48.37	0.76	35.36	0.35	16.27
2	V2	2.53	1.38	54.54	0.73	28.86	0.42	16.60
3	V3	2.27	1.12	49.33	0.69	30.41	0.46	20.26
4	V4	2.41	1.24	51.42	0.69	28.63	0.48	19.95
5	V5	2.82	1.75	62.05	0.81	28.72	0.26	9.23
6	V6	3.68	2.38	64.67	0.93	25.27	0.37	10.06
7	V7	3.79	1.85	48.81	1.08	28.49	0.86	22.70
8	V8	2.56	1.30	50.78	0.97	37.99	0.29	11.33
9	V9	4.12	2.01	48.78	1.12	27.18	0.99	24.04

Analyzing the extra quality stalks it has been noticed that they have represented the highest share from the total of production, being between 48,37 % at variant V_1 and 64,67 % at variant V_6. If in the case of stalk production it has been noticed that production had grown at the same time with the number of fertilizations we can not say that the same thing happened in what the quality is concerned. Thus, for variant V_9, to which we have obtained the highest absolute production (4,12 kg/ha), the extra quality stalks represented only 48,78%. The best quality parameters have been registered at variant V_6 with an extra quality production that represents 64% from the total of production. The second quality type of stalks only had values between 27,18% at variant V_9 and 35,36% at the witness variant. The second quality stalks represented the lowest percentage from the total of production, having values between 9,23% at variant V_5 and 24,04% at variant V_9.

CONCLUSIONS

The research regarding the influence of stage fertilization upon the production and quality of the swiss chards' stalks in an ecological system has allowed the issue of the following conclusions:

1. Fertilization during the vegetation period has got a positive influence upon production, with production increases of up to 91% (V_9).
2. An exagerated application of the stage fertilization leads to important production increases, to the disadvantage of quality and, at the same time there is the risk of overpassing the limit nitrogen dose for surface unit.
3. Administering the fertilizers in one stage, be it on soil or with foil, is not enough to reach a normal output (V_2, V_3 şi V_6).
4. The fertilizers applied on the soil in three stages have had a stronger effect upon the stalk production, in comparison with high applications of foil fertilizations, but the quality of the stalks is better at extra radicular fertilizations.
5. Variant V_6 a registered a production of 36,8 t/ha and a percentage of 64,67% extra quality stalks, being actually the best variant of stage fertilization.

   Good and superior quality production is obtained through a combination of fertilizations on soil and extra radiculary, having in view to always choose a correct fertilization formula.

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