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RESEARCH REGARDING THE INTRODUCTION OF A LEAST KNOWN VEGETABLE SPECIES IN CULTURE, IN TRANSYLVANIAN TABLELAND AREA; THE POSSIBILITY OF CULTIVATING CHINESE CABBAGE IN EARLY SPRING IN OPEN FIELD

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Abstract: The research concerning the possibility of cultivating Chinese cabbage (*Brassica campestris* var. *pekinensis*) took place in the spring of 2011, in the experimental field which belongs to the Vegetable Growing Department from the University of Agricultural Sciences and Veterinary Medicine from Cluj-Napoca. A collection of varieties and hybrids belonging to this species was established, within which a variety (Granat) and four hybrids (Michihli, Kingdom 80, Nepa F1 and Vitimo F1) were used.
During the vegetation period measurements were made regarding the growing and the development of these plants in Transylvanian Tableland specific conditions. The processing of data recorded at harvest shows that the obtained yield varied between 41.00 and 63.15 t/ha, the Vitimo F1 hybrid reaching the highest yield.
The obtained yields are satisfying, considering that the culture was an ecological one, no chemical products such as fertilisers or substances for prevention and control of pests and diseases were used.

Keywords: Chinese cabbage, organic culture, Chinese cabbage varieties

Introduction

Chinese cabbage, *Brassica campestris* var. *pekinensis* (syn. *Brassica rapa* var. *pekinensis*) is a less known vegetable in our country and it is cultivated mostly by amateur gardeners. Unfortunately, in this moment, it isn't defined a well-established culture technology in our specialty literature.

The development of this species in China was parallel with the European cabbages in Europe. Both belong to the same genus, *Brassica*, both evolved by cultivation from wild ancestors, both have been important foods since the remote past, and both now exist in numerous varieties which can be bought almost all year round [DAVIDSON & TOM, 2006].

Chinese cabbage has a short vegetation period, and it belongs to that group of plants which are the fastest growing of all leafy vegetables, in good conditions heads can be cut ten weeks after sowing; loose-headed types two to three weeks sooner, while seedlings four to five weeks after sowing.

The headed types of Chinese cabbage form a barrel-shaped, rounded or tall cylindrical head of closely folded leaves, usually creamy to light green in color, with a crinkled texture, prominent white veining and white midribs broadening out at the base [LARCOM, 2003].

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Material and method

The research took place in the experimental field belonging to the Vegetable Growing Department of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, in the spring of 2011.

The main purpose of this experiment was the establishment of a culture technology, which allows the cultivation of this new species in the Transylvanian Tableland specific conditions. There were tested five varieties of Chinese cabbage in early spring ecological cultures.

To achieve the objectives of this experiment a collection of varieties was organized, which involved the following varieties:

- Michihli
- Kingdom 80
- Granat
- Nepa F1
- Vitimo F1

Each variety was placed into three repetitions.

The seeding started in 25th February, the seeds being sown, one by one, in small nutrient pots and were transplanted in bigger pots in stage of 3-4 true leaves, in 26th of March. Planting was realized in 4th of April, in the experimental field.

During the vegetation period there weren't made any treatments or fertilizations. Harvest was realized in 1st of June at Granat variety and Nepa F1 and Michihli hybrids, and in 10th of June at Kingdom 80 and Vitimo F1 hybrids.

During growing season observations were made regarding plants growth and development (these were made at planting, at one month after planting and at harvesting), and on obtained production to.

Results and discussions

Plants height evolution from planting to harvest. At planting, the highest seedlings (15.33 cm) were those from Granat variety, while at harvest those from Nepa hybrid, with an average height of 52.50 cm.

It can be observed that at four of the five variants the plants height is increasing constantly, but at the last one, represented by Vitimo hybrid, plants average height is decreasing in the last few weeks of the vegetation period, from 31.37 cm to 29.33. This fact can be explained by the head formation, where every leaf has a very important role.

At the remaining variants the height increasing, from planting to a month after planting, varied between 7.83 cm (at Kingdom 80 hybrid) and 26.83 cm (at Michihli hybrid), while until harvest the average height has grown with 3.17 cm (at Kingdom 80 hybrid) and 16.17 cm (at Nepa F1 hybrid) (Fig. 1).

Plants diameter evolution from planting to harvest. The seedlings diameter varied between 13.33 cm (at Vitimo hybrid) and 19.00 cm (at Kingdom 80 hybrid), while at harvest the measured diameters had values between 47.33 cm (at Vitimo hybrid) and 66.50 cm (at Nepa hybrid).

Unlike the plants height, their diameter was increasing constantly at all variants from planting to harvest. So, in one month from planting the plants diameter increasing

varied between 24.67 cm (at hybrid Michihli) and 33.33 cm (at Kingdom 80 hybrid), while until harvest the increasing had much lower values, varying between 1.17 cm (at Kingdom 80 hybrid) and 17.83 cm (at Nepa hybrid) (Fig. 2).

Leaf number evolution from planting to harvest. In Fig. 3 it can be observed that the highest number of leaves was registered at Kingdom 80 hybrid, not only in seedling stage (when it had an average of 7.67 leaves), but at the measurements made at one month after planting (with 19.83 leaves) and at harvest to (when plants were formed in average from 35.67 leaves). This hybrid was closely followed by Vitimo F1, which had an average of 34.67 leaves.

The lowest increasing of leaves number from planting to harvest was registered at Michihli hybrid, which formed only 14.50 leaves in the vegetation period.

Correlation between total number of leaves and total weight. The correlation coefficient between total number of leaves and total weight had a value of 0.73, which is lower than the value of p (5%)=0,88, for the five cases studied, so between these characters there is no statistically supported correlation (Fig. 4).

Cabbage head development at maturity. Data from Table 1 shows that the longest heads (with an average length of 46.83 cm) and largest diameter (with an average diameter of 41.00 cm) were registered at Michihli hybrid. The highest weight of plants (0.73 kg) was noticed at Vitimo hybrid, while the plants belonging to Kingdom 80 hybrid had the highest number of leaves.

Comparison between total plant and head weight. Total head weight varied between 0.56 and 0.88 kg, while the head weight between 0.47 and 0.73 kg. The lowest difference between the two characters was registered at Michihli hybrid (a difference of only 80 g), and the highest one at hybrid Vitimo, where the heads were easiest with 150 g than the plants (Fig. 5).

Correlation between total and head weight. Fig. 6 presents the correlation between total and head weight, the coefficient of correlation between this two characters, being 0.97, which is higher than the theoretically value for p (1%) = 0.96, for the five studied cases, so between total and head weight exists a distinct significant positive correlation.

Leaf layout. The leaf layout is a very important characteristic of Chinese cabbage, because the leaves from rosette are in most cases removed, and only the cabbage head is used. The rosettes were formed, in average, from 5.67 leaves (at Michihli hybrid) and 8.17 leaves (at Kingdom 80 hybrid), while the number of leaves from the heads varied between 14.83 leaves, at Granat variety and 27.50 leaves at Kingdom 80 hybrid, followed closely by Vitimo hybrid, with 27.17 leaves (Fig. 7).

Results regarding the bolting percentage. The measurements made at one month after planting shows that at Michihli hybrid, the bolting percentage was 8.33%, at Granat and Nepa was 12.5%, while at the last two hybrids (Kingdom 80 and Vitimo) no plants had been bolted until this moment, the average bolting percentage being 6.67%.

Until harvest, the average bolting percentage increased, reaching the value of 18.33%, the lowest bolting percentage (8.33%) was registered at Vitimo hybrid, while the highest (29.17%) at Granat variety (Fig. 8).

The influence of variety upon the yield of Chinese cabbage. The data from Table 2 shows that the yields varied between 41.00 and 63.15 t/ha. The lowest yield was registered when Granat variety was used, while the highest one was observed when Vitimo hybrid was cultivated. If Granat variety was took as control variant, a distinct significant

difference was observed at Kingdom 80 hybrid, which has a yield of 49.07 t/ha, with 14.80% more than at Granat variety. In addition to this difference two more very significant differences were observed at Nepa and Vitimo hybrids, where the yields were higher than at the witness variant with 28.48% and 54.02%, their yields being 52.67 and 63.15 t/ha.

If the average yield of the five varieties was considered the control variant, there was registered a distinct significant difference at Granat variety, where the yield was lower with 8.66 t/ha than the average one. Beside this, a significant negative difference was registered at Michihli hybrid (with a lower yield of 7.26 t/ha), and a very significant positive one, at Vitimo hybrid, which had an increased yield with 13.49 t/ha compared with the control variant.

Conclusions

The highest plants with largest diameter, at harvest, were those from Nepa hybrid, which had an average height of 52.50 cm and an average diameter of 66.50 cm.

The plants belonging to Kingdom 80 hybrid, had the highest number of leaves, 35.67, which were followed closely by the plants from Vitimo hybrid, with 34.67 leaves.

Even if between total leaf number and total weight there was no statistically supported relationship, between head and total weight exists a distinct significant positive correlation.

The bolting percentage had an average value of 18.33%, at harvest, with a minimum number of bolted plants at Vitimo hybrid.

The yields varied between 41.00 t/ha (at Granat hybrid) and 63.15 t/ha (at Vitimo hybrid).

The most suitable hybrid, for cultivation in Transylvanian Tableland area is Vitimo F1 (due to its high production and low bolting percentage), followed by Nepa F1 (due to its high yield and good plant development).

In conclusion it can be said that Chinese cabbage can be cultivated in Transylvanian Tableland area, even in early spring ecological cultures, in open field, without using special measures, adding fertilizers or making treatments with synthetic products.

References

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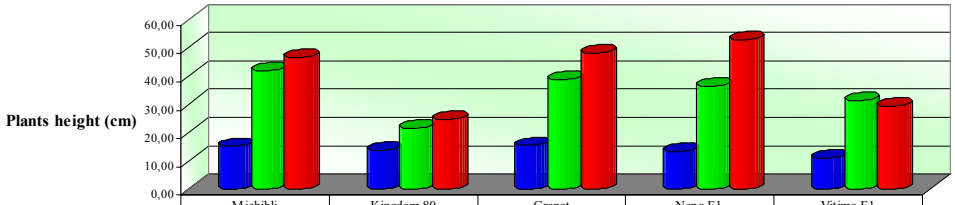
Tab. 1. Cabbage head development at maturity

Variant		Cabbage head			
No.	*Variety / Hybrid*	Lenght (cm)	Diameter (cm)	Weight (kg)	Number of leaves
1	Michihli	46,83	41,00	0,48	16,17
2	Kingdom 80	35,00	34,50	0,59	27,50
3	Granat	44,33	27,50	0,47	14,83
4	Nepa F1	42,00	38,67	0,66	19,83
5	Vitimo F1	28,67	37,17	0,73	27,17
Average		**39,37**	**35,77**	**0,59**	**21,10**

Tab. 2. The influence of variety upon the yield of Chinese cabbage

Variant Hybrid	Average yield (t/ha)	Relative yield (%)	Difference (t/ha)	Significance	Relative yield (%)	Difference (t/ha)	Significance
Granat	**41.00**	**100,0**	**0,00**	**Mt.**	**82.56**	**-8.66**	**oo**
Kingdom 80	**49,07**	**114.80**	**8.07**	**	**94.78**	**-0.59**	**-**
Michihli	**42.40**	**103.41**	**1.40**	**-**	**85.38**	**-7.26**	**o**
Nepa F1	**52,67**	**128.48**	**11.67**	***	**106.06**	**3.01**	**-**
Vitimo F1	**63.15**	**154.02**	**22.15**	***	**127.16**	**13.49**	***
Average	**49.66**	**-**	**-**	**-**	**100,0**	**0,00**	**Mt.**
***LSD* (p 5%)**				**6,09**			
***LSD* (p 1%)**				**8.05**			
***LSD* (p 0,1%)**				**11.25**			

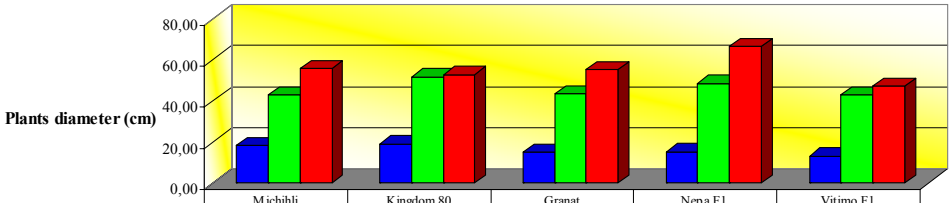
FIGURE CAPTIONS



	Michihli	Kingdom 80	Granat	Nepa F1	Vitimo F1
At planting	15,00	13,67	15,33	13,33	11,00
One month after planting	41,83	21,50	38,67	36,33	31,17
At harvest	46,50	24,67	47,83	52,50	29,33

Variant

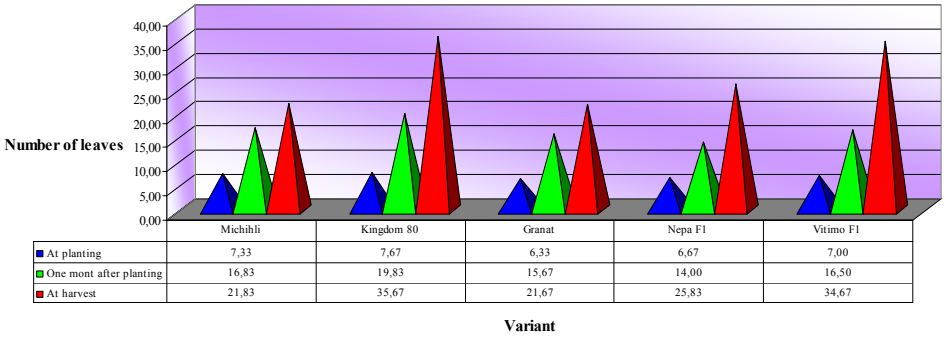
Fig. 1. Plants height evolution from planting to harvest



	Michihli	Kingdom 80	Granat	Nepa F1	Vitimo F1
At planting	18,33	19,00	15,00	15,33	13,33
One month after planting	43,00	51,67	43,50	48,67	42,83
At harvest	55,83	52,83	55,17	66,50	47,33

Variant

Fig. 2. Plants diameter evolution from planting to harvest



	Michihli	Kingdom 80	Granat	Nepa F1	Vitimo F1
At planting	7,33	7,67	6,33	6,67	7,00
One mont after planting	16,83	19,83	15,67	14,00	16,50
At harvest	21,83	35,67	21,67	25,83	34,67

Fig. 3. Leaf number evolution from planting to harvest

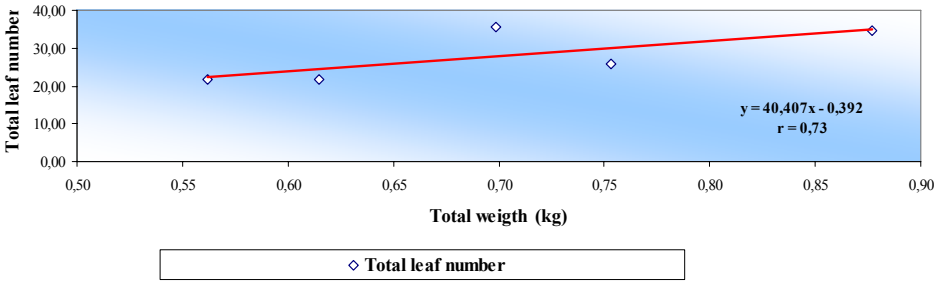
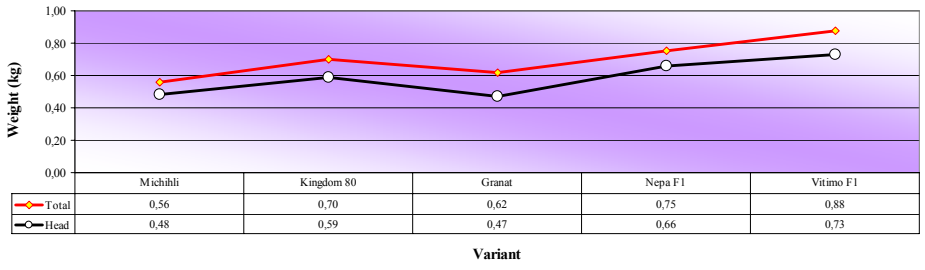


Fig. 4. Correlation between total number of leaves and total weight
n=5, p(5%)=0.88, p(1%)=0.96



	Michihli	Kingdom 80	Granat	Nepa F1	Vitimo F1
Total	0,56	0,70	0,62	0,75	0,88
Head	0,48	0,59	0,47	0,66	0,73

Fig. 5. Comparison between total plant and head weight

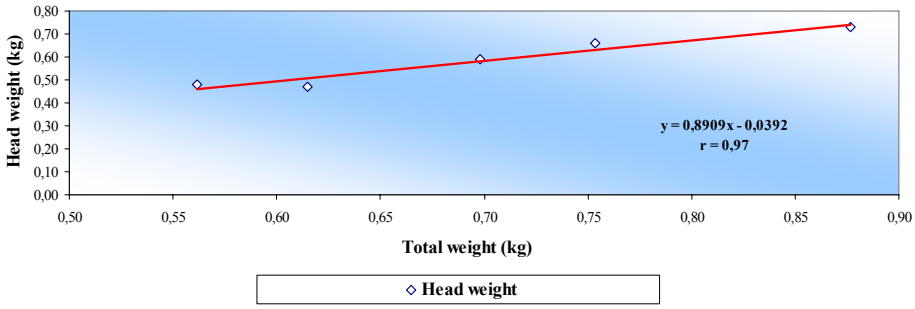
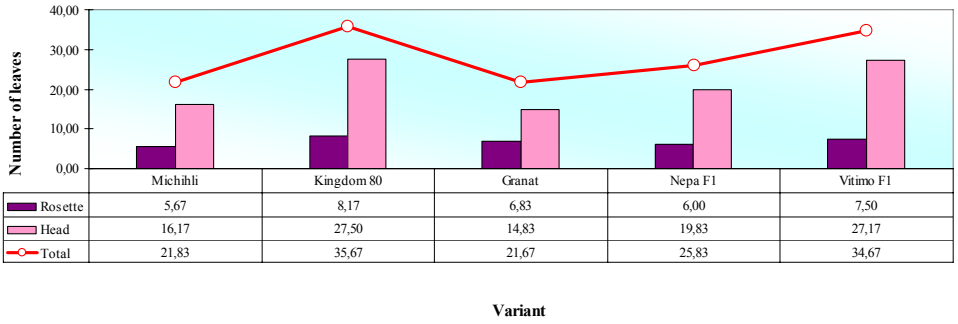


Fig. 6. Correlation between total and head weight
n=5, p(5%)=0.88, p(1%)=0.96



	Michihli	Kingdom 80	Granat	Nepa F1	Vitimo F1
Rosette	5,67	8,17	6,83	6,00	7,50
Head	16,17	27,50	14,83	19,83	27,17
Total	21,83	35,67	21,67	25,83	34,67

Fig. 7. Leaf layout

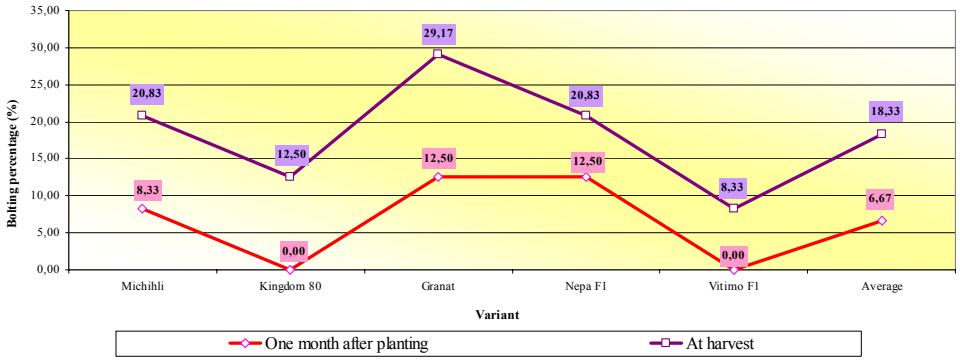


Fig. 8. Bolting percentage