UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE „ION IONESCU DE LA BRAD" IAŞI
FACULTY OF HORTICULTURE
DOCTORATE FIELD: HORTICULTURE
SPECIALIZATION: VEGETABLE GROWING

Ing. SĂBĂREANU CARMEN – MARIA

(married STOLERU)

DOCTORAL DISSERTATION

SCIENTIFIC LEADER,

Prof. univ. dr. STAN NISTOR

-IAŞI-

2010

UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE „ION IONESCU DE LA BRAD" IAŞI
FACULTY OF HORTICULTURE
DOCTORATE FIELD: HORTICULTURE
SPECIALIZATION: VEGETABLE GROWING

Eng. SĂBĂREANU CARMEN – MARIA

(married STOLERU)

DOCTORAL DISSERTATION

RESEARCH ON THE TECHNOLOGY FOR WHITE CABBAGE GROWING (*Brassica oleracea* L., *var. capitata* L., *f. alba* DC.) IN ECOLOGICAL VEGETABLE SYSTEM, IN CONDITIONS OF IASI COUNTY

SCIENTIFIC LEADER,

Prof. univ. dr. STAN NISTOR

-IAŞI-

2010

ABSTRACT

Organic Farming in general and organic vegetable growing in particular, is based on thorough knowledge of production systems that exploit local resources within, to minimize economic and environmental inputs. Organic vegetable systems were considered: the conservation of ecosystems, providing the population with healthy food, without contaminants, ensuring a favorable social environment, economic development of farm rural sustenability etc..

Organic vegetable promote those methods and means to address these global problems, caused by daily consumption of these products by promoting mixed vegetable - type and the minimum - vegetable integrated production-processing-marketing. In accordance with EC Regulation 834 / 2007, EU countries are using the same sense, the following terms: organic farming (England), biological farming (Greece, France, Italy, Netherlands and Portugal) and ecological farming (Denmark, Germany, Spain, Romania, etc.)..

Organic farming, interact constructively in enhancing quality of life with natural systems and cycles. One objective of this system is to produce high quality food but in sufficient quantities. The production means and techniques they use organic vegetable, products are obtained with high nutritional quality, without residues of pesticides or nitrates, with high content of nutrients, using exclusive degradable organic or biological materials to ensure the ecological balance of the agricultural system.

White cabbage crop establishment in all three systems, means first meeting in the best possible conditions plants requirements to environmental factors. Therefore, technology should have those measures, which to satisfy these requirements, based on organic crop system, which is very restrictive. Topic under study aims to address issues related to growing older white cabbage but in the context of implementing those measures and technological resources in a sustainable system of cultivation, namely, the ecological system.

To achieve its purpose, I planned to achieve the three series of experiments, which considered the following general objectives:

Objective 1. The study of technological factors on the overall cabbage yield ,

Objective 2. Influence of technological measures applied to the crop of white cabbage in organic on some qualitative features of heads,

Objective 3. Determination of soil quality culture by studying the characteristics of white cabbage physical, biochemical and biological characteristics of the biotope.

Experiments were organized at EDS "V. Adamachi" Iasi between 2006-2008, in three series of experiments, at crop of white cabbage to head the field. Biological material used for the cultivation of white cabbage crop was the appropriate microclimate conditions in the area NE of Romania, studied for conventional crops. The results will be both theoretical and practical solutions for professionals in the production of some principles about the possibility to growing organic white cabbage.

Objective 1. The study of technological factors on the overall yield of cabbages:

To achieve the first generally objective were developed following specific objectives:

Os.1. Influence of cultivar on white cabbage yield;

Os.2. Influence of time planting on cabbages yield;

Os.3. The influence of planting distance on white cabbage yield;

Os.4. Influence of cultivar x time planting combinations on white cabbage yield;

Os.5.Influence of cultivar x planting distance combinations on white cabbage yield;

Os.6. Influence of time x distance planting combinations on white cabbage yield;

Os.7. Influence of cultivar x fertilizer type combinations on cabbage yield ;

Os.8. Influence the cultivar x pest control measures interaction on white cabbage yield.

Choosing cultivars is one of the most important technological measures that we have to consider the establishment of vegetable crops, mainly determined by the climate of the production system is obtained.

The influence of cultivar on the early crop production in the period 2006 - 2008, it ranged from 27.86 t / ha for Timpurie de Vidra to 32.00 t / ha to the K001 F1 cultivar of .

Regarding the influence of cultivar on summer cabbage yield, it ranged from 34.28 t / ha in Copenhagen Market growing by 34.67 t / ha to the Gloria cultivar.

Regarding the influence of variety on total yield of late crop in the experimental period, it ranged from 45.64 t / ha in Lares variety to 48.03 t / ha in variety of De Buzau.

Regarding the influence establishment of yield in early cabbage, we can say that it varied from 29.89 t / ha to 31.01 t / ha, in summer cabbage yield varied from 34.09 t / ha when the culture was planted at 15.05 to 35.11 t / ha when setting up crop was made at 07.05. Differences obtained between the three time planting are establishing small and does not affect significantly the total,

only a very limited extent. Differences obtained between the three graduations production of establishing a crop period of autumn white cabbage are very small and does not affect production significantly.

In the area of nutrition influence the production of white cabbage in the three crop systems, we can say that late varieties behave better when the feeding area is about square shape (60x50 cm) compared with summer varieties in the space nutrition is the preferred rectangle (70 cm x 40 cm) or the early 70 x 30 cm.

The results of four shows following objective: for best early crop results were obtained by growing the F1 K001 planted on 7.4. for summer crops best results were obtained by Copenhagen Market planted on 5.7 and Buzau planted variety in 20.06. achieved a yield increase from Lares planted at the same time, of 4.77 t / ha.

For five specific objective, we can say that production varies from cultivar to other and a crop system to an other. In early culture best results were obtained by the combination F1 K001 planted at distances of 70 cm x 30 cm (33, 54 t / ha), compared to the early variety was planted otter at distances of 60 cm x 40 cm (27.06 t / ha). For summer crop of cabbage, mix Copenhagen Market x (70 cm x 40 cm) made the high yield (36.15 t / ha), the shortfall Gloria x (60 cm x 50 cm) being 2.93 t / ha. In the total production in winter cabbage, the best results were achieved variant in which Buzau variety was planted at distances 60 cm x 50 cm (48.95 t / ha).

The combination of the influence of time x planting distance, the total yield in white cabbage crop that stands out early best results were obtained by a combination of time range 07.04 x 70 cm x 30 cm, regardless of cultivar. For summer crop, satisfactory results were obtained when the crop was established in the time range 07.05 to 70 cm x 40 cm (36.64 t / ha). The best results obtained in autumn crops were obtained if the planting was done in 27.06 times at distances of 60 cm x 50 cm (48.26 t / ha), compared to the same date been planted at distances 80 cm x 40 cm (45.59 t / ha).

Regarding the influence of combinations cultivar x fertiliser type on cabbage yield, we can say that production growth achieved varies from cultivar to cultivar and fertilization regime to another. Early cabbage gave the best results for cultivar K001 fertilised with 25 t / ha poultry manure (32.43 t / ha) compared with Timpurie de Vidra fertilized with fermented poultry manure - 15 t / ha + green manure - facelia - 10t / ha. Increase production from the average experience was 6.03 t / ha. Influence the interaction between cultivar and type of fertilizer used for fertilization had a significant separate influence. Production increased from 30.37 t / ha when Gloria cultivar had

fertilized with green manure (facelia) - 20 t / ha to 37.50 t / ha for Copenhagen Market cultivar fertilised with 25 t / ha poultry manure , growth was achieved by 7.13 t / ha.

For the autumn crop, yield increases achieved between the two combinations of factors were up to 11.5 t / ha. Production increased from 43.07 t / ha when Lares cultivar had fertilized with 25 t / ha poultry manure to 54.57 t / ha for a Buzau variety with agrofond of fermented poultry manure - 15 t / ha + green manure - facelia - 10 t / ha.

Regarding the influence of interaction cultivar x pest control measures, the total production in white cabbage, we can say that most damage was caused by: cabbage flea (*Phyllotreta atra* L.), GA - 13.7% - summer culture / Gloria variety, cabbage fly (*Delia brassicae* Bche) GA - 14.5 % - early crop / K001 cultivar, headed eagle (*Mamestra brassicae* L.), GA - 7.9%, late crop / Lares cultivar.

For best results early crop production were obtained when cultivar K001 was used as a protective blanket system - Agril (32.57 t / ha) than Ditmark when used Neemazal T / S - 0.4% (22.07 t / ha). Differences in the average production experience ranged from -4.69 t / ha (Ditmark x Neemazal T / S - 0.4%) to 5.81 t / ha (K001 X-Agril blanket system). The summer cabbage crop production ranged from 32.13 t / ha if Gloria cultivar when used Neemazal T / S - 0.4% + x *Trichogramma evanescens* application (eg. 120,000 / ha) to 37.83 t / ha for Copenhagen Market cultivar when used as a protective blanket system + Neemazal T / S - 0.4% + x *Trichogramma evanescens* application (eg. 120,000 / ha).

The best results in late crop were obtained from Buzau cultivars when used as a protective measure Neemazal T / S - 0.5% (54.47 t / ha) compared to when Lares we used Dipel - 0 15% (43.60 t / ha). Increase of production obtained by the interaction of the two combinations of factors was 10.87 t / ha.

Objective 2. Influence of technological measures applied to the crop of white cabbage in organic system on qualitative features of the heads.

To achieving this generally objective have been designed three specific objectives:

Os.1. Influence of technological factors on water content and dry matter in white cabbage;

Os.2. Influence of technological factors on nitrite and nitrate content in white cabbage;

Os.3. Influence of technological factors the heavy metal content (Pb, Cd, Cu) in white cabbage.

Following the determinations made, we can say the following:

Moisture content ranged from head 91.99% in autumn crops fertilized and mulched with green manure to 93.87% in early crop unmulched. Dry matter content increased from 6.13% to 8.01% for the autumn crop fertilized and mulched with green manure.

The content of nitrites in early cabbage increased from 0.34 mg / kg in control version (unfertilized, unmulched) to 0.72 mg / kg in the variant fertilized with 30 t / ha poultry manure and mulch with plastic and nitrate content increased from 40.11 mg / kg in control version to 98.76 mg / kg in variant fertilized with In summer cabbage,30 t / ha poultry manure and mulched with green manure . nitrite content increased from 0.37 mg / kg in control to 0.85 mg / kg in variant fertilized with 30 t / ha poultry manure and mulch with biodegradable plastic, and nitrate content increased from 42.17 mg / kg in control to 108.26 mg / kg fertilized variant with 30 t / ha poultry manure and mulched with green manure.

The content of nitrites in late cabbage ranged from 0.62 mg / kg in control version to 1.27 mg / kg in the variant fertilized with 30 t / ha poultry manure and mulch with plastic and nitrate content ranged from 57.6 mg / kg in control to 154.59 mg / kg in variant fertilized with 30 t / ha poultry manure with mulch of green manure.

The results were much lower than limits maximum permitted by Regulation EC 1881/2006, as limit for nitrates is provided by 3500 mg / kg and the limit for nitrites was removed as they are in very small quantities are transformed into nitrates.

The lead content in early cabbage increased from 0.786 mg / kg in version control (unfertilized, unmulched) to 1.007 mg / kg in the variant fertilized with 30 t / ha poultry manure and plastic mulch, cadmium ranged from 0.7036 mg / kg in control to 0.9674 mg / kg in version fertilized with 30 t / ha poultry manure and mulch with plastic, and copper content increased from 0.1877 mg / kg in the variant fertilized and plastic mulch to 0.3624 mg / kg in version fertilized with 30 t / ha poultry manure and unmulched.

The lead content in summer cabbage ranged from 0.813 mg / kg in control until 1,209 mg / kg in variant fertilized with 30 t / ha poultry manure and plastic mulch, cadmium content ranged from 0.7443 mg / kg in control to 1.2666 mg / kg in variant fertilized with 30 t / ha poultry manure and mulch with plastic and copper content ranged from 0.1988 mg / kg in fertilized variant with plastic mulch to 0.4652 mg / kg in the variant fertilized with 30 t / ha poultry manure and unmulched.

The lead content in late cabbage increased from 0.924 mg / kg in control until 1,374 mg / kg in variant fertilized with 30 t / ha poultry manure and mulch with plastic. Cadmium content ranged from 0.8325 mg / kg in control to 1.4130 mg / kg in the variant fertilized with 30 t / ha poultry manure and mulch with plastic and copper content increased in the variant fertilized and mulch plastic of 0.2204 mg / kg to 0.5234 mg / kg fertilized version of 30 t / ha poultry manure and unmulched.

Maximum permissible limit for cadmium in field vegetables is 200 mg / kg and lead is 300 mg / kg. Values obtained from experiences are very small compared with those recognized by the EC Regulation reviewed 1881/2006.

Objective 3. Determination of soil quality from white cabbage crop through the study of physical, biochemical and biological characteristics of biotope .

To achieve this overall objective was designed four specific objectives:

Os.1. Determination of physico-mechanical and chemical traits of soil resources at EDS Iaşi

Os.2. Determination of the biological resources of the soil at EDS Iaşi

Os.3. Determination of synthetic biological indicators of fertility and soil quality at EDS Iaşi

Os.4. Ecopedologic matrix determination of effective trophicity soil resources at EDS Iasi.

Analysis of specific environmental records show that most factors and ecological determinants of falls in organic medium size classes, and classes for middle and high favorability organic vegetable crops.

The small size class, by default stress falls: excessive and prolonged summer drought, low relative humidity of summer air and low aeration porosity, coupled with high clay content.

There is a distinction between research results and turn on the range of rows. In the interval between rows in the control unmulched values of aeration porosity and soil consistency summer, also in terms of soils with high trophic potential are reduced by 30-50% become limiting risk factors and stressful for extension and nutrition roots side. When applying the film on the range, indicating a decrease porosity of aeration, the effect of film stress on gas exchange between soil and atmosphere. In organic agriculture, the aeration porosity values are higher compared with conventional vegetable.

Higher values of biotic indicators (soil respiration and celulozoliza) of the enzyme (catalase, zaharaza, urease and phosphatase, total) and IPAV synthetic indicators, ISB and IPAE, highlights the positive impact on normal nutrition of vegetables. The lowest values are highlighted in early cabbage crop in unmulched system, both on line and on time.

Effective analysis of soil organic diagnosis as an indicator of interaction synthetic organic factors, and highlights the effects of negative human impact uncontrolled conventional culture system compared to the ecological system.

Summed value up the notes for the ten quality indicators scores indicate more differentiated diagnosis of ecopedologic trophicity effective soil resources in the field based on qualitative assessment is made and highlights the effects and intensity of risk factors on fertility and quality traits .

For all three culture systems green technology with biological data correlating highlights the positive effect of the use of film mulch and green manure, thus reducing stress and limiting the effects of summer drought and anthropogenic influence acting on soil quality and plant and vegetable production in an environmentally sound and sustainable development in the NE of Romania.