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ABSTRACT

Enriching knowledge of the role of some characteristics and indicators of sustainable cultivation techniques in order to increase the yield and quality of production, may contribute to increased opportunities to expand cultivation areas of *Origanum vulgare* L. (oregano) species in our country.

Improving technical and economic results at the level of any culture, is an objective necessity and in can be realised, in good condition, in a continuous process of optimization and re optimization of production technologies and the main economic activities.

The species chosen for this study, *O. vulgare* L., is, unfortunately, very little valorised, although its versatile importance is well known. At the same time, within the national tradition, the range of aromatic and spicy vegetable species is a relatively small segment, which can be found from small areas cultivated with them.

Assessing knowledge of Romanian special literature, we can observe the low and incomplete average of scientific information, although at global level detailed knowledge are outlined on the systematic of species, its specific botanical, physiological and chemical particularities, existence, in particular, to many results on the chemical composition of volatile oil will all the benefits it presents. The exquisite interest in cultivating this species is primarily due to volatile oil content of thymol and carvacrol, which gives special meanings of herbs and spices.

In these circumstances, the purpose of studies and research for this thesis is to improve knowledge on biological, physiological and ecological characteristics of the species *O. vulgare* L., in order to sustain and develop an efficient technology for cultivation under sustainable agriculture conditions in Iasi county in similar ecological conditions.

For this purpose six major objectives were established:

- study of administrative and organizational and natural framework conditions the researches have been conducted;



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- morphological study of the species, under different planting densities corresponding to climate zone in Iasi county.
- study the influence of nutritional substrates on seed germination and oregano seedling quality;
- studies and research to optimize cultivation technology through technological factors: density of culture, system of mulching and fertilization regime;
- study of the quantity and quality of essential oil of oregano under the influence of different levels of nitrogen fertilization;
- the study of economic efficiency of production of oregano.

Study and research activities were conducted in 2009-2012, in laboratory and experimental field of the Department of Vegetable Growing, from the Faculty of Horticulture from U.Ș.A.M.V. Iasi and within vegetable farm in the SC Biarom Iasi, based on a scientific research partnership. Also, some research has been conducted in laboratory and experimental field of the University "Aldo Moro" in Bari, Italy.

The thesis is divided into two parts and ten chapters.

Part I - The current state of scientific and technical knowledge, which includes two chapters.

Chapter I presents generalities on spices and aromatic plants in the culture and civilization of mankind, but also their importance, targeting primarily the species *O. vulgare*. In this respect, the chapter details knowledge on the importance of culinary, ornamental, therapeutic, cosmetic, honey and agrotechnics species as well as some botanical, biological and ecological peculiarities.

From oregano, as vegetable plant, fresh or dried stems and leaves are used as seasoning for a variety of dishes (salads, soups, sauces, marinades, pickles, mushroom dishes, meat, and fish), enhancing the flavour and digestibility, as well as for other pastries, as flavouring ingredient. As medicinal importance, oregano has a multitude of benefits in: liver and digestive system, diseases of the respiratory system, nervous system etc.

Oregano is a perennial herb of the *Labiatae* family which originates from the Mediterranean area. Agrobiological peculiarities emphasize that the main features are quantitative and qualitative indicators that show ecological rusticity and plasticity of the species and that it can find optimal conditions in the hilly steppe region of Moldova.



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Chapter II refers to technologies used in sustainable system. When elaborating this chapter, research conducted in our country, but those realized especially worldwide, on some biological features and of technological links were synthesized.

Part II – Own studies and researches, it comprises eight chapters.

Chapter III - Purpose, objectives and general WORK methodology for achieving proposed objectives. The purpose and objectives were presented above. The used biological material consisted of seeds, oregano seedlings and harvest. In order to reach objectives the following working methods were used: observation, documentation, benchmarking, statistical clustering and data systematization experiment etc.

Chapter IV presents a study on the natural framework and ecological conditions of experimentation in relation to the ecological requirements of the *species O. vulgare*. The study had two specific objectives, study administrative and organizational conditions with reference to the unit profile where investigations were carried out and the structure of vegetable farm and landscape study conditions on relief, soil science and hydrology, as well as climate and weather conditions, flora and fauna. Studies were made based on factual material or physical data on key values of physical and economic indicators that define the analyzed factors.

Regarding the study of administrative and organizational conditions, the general conclusion is that the optimal technical and organizational conditions for conducting research were met.

Regarding the study of landscape conditions, on relief, soil science and hydrology, climate and meteorological conditions, flora and fauna it can be concluded that the studied aromatic herb and vegetable seasoning can find good conditions for growth and development, but they must be corrected by technological works.

Chapter V refers to the second major objective of the morphological characterization of oregano plant under the influence of planting density.

The used material consisted of seeds, seedlings, plants and parts (plant fragments) as well as obtained fresh and dry yields.

To achieve the planned research, the working method consisted of observations and biometric measurements during the two-year study (2010-2011), allowing morphological and agroproductive characterization of cultivated species, grown under sustainable agriculture conditions, appropriate to North-eastern Romanian climate zone (Iassy county).

The morphological study of *O. vulgare L.* plants was followed by comparison, levelled on the growth phenol-phases (phenol-phase of shoots issue, phenol-phase of floriferous stems, flower buds formation phenol-phase and full flowering phenol-phase). The main characteristics



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considered in this experience were: plant height, diameter of bushes, number of shoots/bush, number of inflorescences/shoot, number of leaves/shoot, the weight of the fresh air part, the weight of the dry air part. Results of these features demonstrate the ecological plasticity of the species and that it can be grown in presented technological terms.

Chapter VI refers to the third major objective of the thesis, referring to the study of seed germination, according to different nutrient substrates. Those activities of specific research, establishing the influence of nutritional substrata were carried out, they were made based on predetermined recipes on the seed germination process of oregano, of varieties of different sources, tracking and development of seedlings emergence in dynamics, setting mixture of substrate that provides conditions of optimal nutrition and growth of young plants root system, seedling quality though assessment complex clues. Nutritional substrates whose composition is 100% peat, peat and garden mould ($T_{75} + M_{25}$) or peat and sand garden mould ($T_{70} + M_{20} + N_{10}$) were found to have the best effect on seed germination and seedling quality.

Chapter VII - Research on optimization of technological factors on the culture of oregano. In order to elaborate this chapter research focused on the following objectives were performed: setting up the influence of culture density on output, determining the influence of soil mulching system and determining influence of fertilization on the production system.

Regarding the first objective - setting up the influence of oregano culture density on harvest, the results showed that the medium density, that of 38,000 plants/ha, determines the most significant production of 4.59 t/ha dry vegetative mass.

Regarding the second objective - establishing soil mulching system influence on production, it is ascertained that at the variant with polyethylene mulch higher vegetative biomass values were obtained of 4.86 t/ha.

If we consider to last objective - setting influence of fertilization on the production system, it is concluded that the most relevant variant was the variant treated with Cropmax, which generated a dry plant mass production of 4.54 t/ha.

In the same chapter we also studied the influence of combination of two experimental factors, but the most conclusive experiment was to study the influence of the combination of the three experimental factors, which were studied in 27 experimental variants.

From these results and the significance of differences result that the highest production (5.54 t/ha) was obtained in the variant with a density of 38 000 plants/ha, mulching with black polyethylene film and fertilized with Cropmax product (variant V_{14}).

Chapter VIII includes a study regarding the qualitative and quantitative content of the oil extracted from oregano plants, depending on the level of nitrogen fertilization. It was



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conducted in a research internship conducted at the University "Aldo Moro" in Italy. Research has been conducted using the essential oils extraction method and chromatographic analysis coupled with mass spectrometry.

Following analysis of data obvious differences between the four experimental variants are observed. Richest oil identified percentage, of the total of oil obtained from oregano leaves, it can be observed at variant V_3 (N_{120}), where it reached 97.83%, as opposed to witness variant, where the content has registered a figure of 96, 23%. A significant yield in volatile oil, in total oil from the flowers of oregano was determined at variant V_2 (N_{40}), where it was of 98.43%, in contrast to the witness variant, where the content reached a value of 97.60%.

Chapter IX - Aspects of economic efficiency of the culture of oregano. Research in this chapter presents a study of the economic efficiency of oregano culture, using specific methods of economic analysis by comparing key indicators (production, costs, revenues), as well as derivatives clues as profit and profitableness rate and return rate.

From the analyzed results it results that the highest profit rate is recorded in V_2 (density of 19,000 plants/ha and mulching with polyethylene film) and 92% and V_5 version (density of 38 000 plants/ha and mulching with polyethylene film) respectively 75% .

Production and delivery price exerted a favourable action on increasing revenue, mainly contribution in this regard (about 96%) coming to average unit selling price or better said, of the the relationship between the unit price and cost of production.

The presented data show that, on average in the nine variants output is 5.68 t/ha, with a sale price of 10 lei/kg, a variable cost of 27633.3 lei/ha and a fixed cost of 10 514 , 92 lei/ha resulting an average profitableness rate of 2150 kg/ha.

Profitability stage at the price of 10 lei/kg oregano production is between the production of 1,453 kg per hectare production in variant V_2 - (19. 000 pl/ha x polyethylene film) and 3458 kg/ha for variant V_3 - (57,000 pl/ha x cereal straw), which marks that these productions do not record any profit or loss.

In **Chapter X** - General conclusions of the thesis are presented. It follows that the purpose and objectives of the conducted research were fully realized, being made available to those interested in a fund of complex and complete knowledge of vegetable species *O. vulgare*, as a part of technical solutions by which this culture can be promoted and generalized in vegetable production.