SUMMARY

Quinoa (*Chenopodium quinoa* Willd) is a species native to Central America, specifically in the area of Lake Titicaca in the Andes Mountains. According to archaeological sources, it has been cultivated in the Andean area for about 5,000 years for its nutrient-rich seeds. After the Spanish conquest, the quinoa crop was replaced by wheat, only in isolated, inaccessible areas, it was cultivated. In the first decades of the twentieth century, the species was cultivated outside the Andean area, gradually being subjected to studies and research that have highlighted its nutritional and agronomic value. In 1996, quinoa was classified by the FAO as one of the most promising crops for humanity, not only for its beneficial properties on health but also for its multiple uses, considering it as an alternative to solve serious human nutrition problems. The year 2013 has been declared the "International Year of Quinoa." The seeds are rich in proteins, which contain all the essential amino acids, vitamins, polyphenols, phytosterols, isoflavones, carotenoids, lipids, carbohydrates, betaines, minerals, etcetera. Lack of gluten recommends seeds for the diet of people intolerant to gluten in cereals and low glycemic index for people with diabetes.

Quinoa for grain is grown on larger and larger areas around the globe. Leaves are also used in food as a substitute for spinach and inflorescences as a substitute for cauliflower.

Quinoa leaves have an appreciable content of phytosterols, polyphenols, proteins, lipids, minerals, etc. substances necessary for the human body's diet, many biochemical compounds not being identified.

The development of a quinoa production technology, used as a vegetable from which the leaf is consumed, as well as the study of the influence of technological factors on the production and quality of leaves in the ecopedological conditions in Romania, was a necessity.

The research was undertaken to elaborate the doctoral thesis entitled **“Contributions regarding to the introduction *Chenopodium quinoa* Willd crop, as vegetable plant”** was carried out between 2017 and 2019, in a “I.I. Vitănescu Eugenia” stationary farm from Cudalbi, Galați County.

The purpose of the doctoral thesis was to study the influence of different practices on the quantity and quality of quinoa leaf production, to introduce it in culture, as a vegetable for leaves.

To achieve this goal, the following objectives have been set up:

a) the study of the natural environmental conditions in which the researches were carried out;

b) the study of the influence of technological factors (cultivar, establishment time, density and fertilization regime), on the quantity of quinoa harvest;

c) the study of the influence of technological factors (cultivar, establishment time, density, and fertilization regime) on the quality of quinoa leaves.

The biological material used consisted of three varieties of quinoa growed in Europe: Titicaca, Puno, and Vikinga.

Biotechnical working materials used in the experiment were represented by fertilizers: Micoseed MB, KSC II, and Orgevit.

The results we obtained were processed by statistical-mathematical methods, using the analysis of variation (ANOVA) for 95% confidence, the Tukey and Duncan´s test to determine the significance of the differences.

To achieve the proposed goal, the research focused on two series of experiments, in which the influence of experimental factors on both the quantity and quality of the crop was studied.

The first series of experiments was organized between 2017-2018, and aimed at the influence of the interaction: cultivar x establishment time x crop density, on the quantity and quality of the leaves.

Based on the established factors, 27 experimental variants resulted, each experimental variant organized with three replications. The surface of an experimental plot was 7.5 m^2, resulting in a total harvestable area of experience of 607.5 m^2.

The factors studied were:

Factor A - Cultivar:

A_1 - Titicaca;

A_2 - Puno;

A_3 - Viking.

Factor B – Sowing time, with three graduations:

B_1 - April 3rd;

B_2 - April 10th;

B_3 – April 17th.

Factor C – Crop density, which has three graduations:

C_1 - 7.7 million plants per hectare (12.5 cm x 1 cm);

C_2 - 3.2 million plants per hectare (12.5 cm x 2.5 cm);

C_3 - 1.6 million plants per hectare (12.5 cm x 5 cm).

The second series of experiments was organized during 2018-2019 and focused on the influence of the cultivar, density, and fertilization regime on the quantity and quality of the harvest.

Based on the established factors, 27 experimental variants resulted, each experimental variant organized with three replications. The surface of an experimental plot was 7.5 m^2, resulting in a total harvestable area of experience of 607.5 m^2.

The factors studied were:

Factor A - Cultivar:

A_1 - Titicaca;

A_2 - Puno;

A_3 - Vikinga.

Factor B - Density, which has three graduations:

B_1 - 7.7 million plants per hectare (12.5 cm x 1 cm);

B_2 - 3.2 million plants per hectare (12.5 cm x 2.5 cm);

B_3 - 1.6 million plants per hectare (12.5 cm x 5 cm).

Factor C - Fertilization regime, with three graduations:

C_1 - Chemical;

C_2 - Biological;

C_3 - Organic (Basic Fertilization).

The doctoral thesis comprises seven chapters, is structured in two parts:

Part I. Contributions to the introduction to the culture of the species *Chenopodium quinoa* Willd comprises two chapters:

Chapter I. International and national circumstances concerning the quinoa species;

Chapter II. The current state of knowledge on the cultivation technology of the *Chenopodium quinoa* Willd species.

Part II. The results of my research, structured in five chapters:

Chapter III. Purpose and objectives of the research. Materials used and Methodology;

Chapter IV. The study of the natural and meteorological conditions in which the research was carried out;

Chapter V. Results on the influence of cultivar, epoch, and density on indicators of quinoa production;

Chapter VI. Results on the influence of cultivar, density and fertilization on indicators of quinoa production for leaves;

Chapter VII. General conclusions and recommendations.

The references list contains 168 specialized titles from abroad, as well as from the country.

The two chapters of the first part of the paper provide general information on the current state of knowledge on quinoa crop. The two chapters were made following documentation from various sources, in the country and abroad: textbooks, books, scientific articles, doctoral theses, and web information.

The first chapter of the thesis is structured in three subchapters. It provides information on the food, economic, and agrotechnical importance of quinoa cultivation, as well as risk factors—the circumstances of the cultivation of *Chenopodium quinoa*Willd, worldwide and in Romania.

The second chapter consists of four subchapters and deals with the current state of knowledge on quinoa cultivation technology: species systematics, botanical and biological characteristics, growth and development phenophases, and species requirements for ecological factors, and current research on the framework, growing technology.

The second part of the thesis comprises five chapters and reflects the author's contribution to the research topic.

The third chapter includes the motivation, purpose, and objectives of the doctoral thesis, the materials used, the general work methodology, and the analyzes performed.

The fourth chapter presents the conditions of the natural and meteorological framework in which the researches within the doctoral thesis were carried out.

The fifth chapter contains the results of research on the influence of cultivar, epoch, and density on quinoa production indicators.

Results on the influence of cultivar, epoch, and density on biometric and physiological indicators on quinoa leaves.

Results on the individual influence of cultivar, epoch, and density on biometric and physiological indicators on quinoa leaves, namely:

- The influence of the cultivar on the number of leaves, the leaf surface, the mass of the leaves, and the production;
- The influence of the epoch on the number of leaves, the leaf surface, the mass of the leaves and the production;
- The influence of density on leaf number, leaf area, leaf mass, and production.

Results on the combined influence of the cultivar, epoch, and density on the number of leaves, leaf area, leaf mass, and production.

Results on the individual influence of the cultivar, epoch, and density on some biochemical compounds in quinoa leaves, namely:

- The influence of the cultivar on polyphenols, phytosterols, primary metabolism compounds, minerals, and antinutritive compounds;
- The influence of the epoch on the content of polyphenols, phytosterols, primary metabolism compounds, minerals, antinutritive compounds;
- The influence of density on the content of polyphenols, phytosterols,

primary metabolism compounds, minerals, antinutritive compounds.

Results on the combined influence of cultivar, epoch, and crop density on biochemical compounds in quinoa leaves.

The sixth chapter contains the results of our research on the influence of cultivar, density, and fertilization on biometric and physiological indicators in quinoa leaves.

Results on the individual influence of cultivar, density, and fertilization on biometric and physiological indicators in quinoa leaves:

- The influence of the cultivar on the number of leaves, the leaf surface, the production and the mass of the leaves;
- The influence of density on the number of leaves, leaf area, production and mass of leaves;
- The influence of fertilization on the number of leaves, leaf area, production, and mass of leaves.

Results on the combined influence of cultivar, epoch, and density on biometric and physiological indicators of quinoa leaves.

Results on the combined influence of the cultivar, epoch, and density on the number of leaves, leaf area, production and mass of leaves.

Results on the individual influence of the cultivar, epoch, and density on some biochemical compounds in quinoa leaves.

- The influence of the cultivar on polyphenols, phytosterols, primary metabolism compounds, minerals, and antinutritive compounds;
- The influence of density on the content of polyphenols, phytosterols, primary metabolism compounds, minerals, antinutritive compounds;
- The influence of fertilization on the content of polyphenols, phytosterols, primary metabolism compounds, minerals, antinutritive compounds.

Results on the combined influence of cultivar, density, and fertilization on the biochemical indicators of quinoa leaves.

Results on the influence of cultivar interaction, density, fertilization regime on the content of polyphenols in quinoa leaves.

The seventh chapter contains the conclusions of the research undertaken as well as recommendations on the cultivation of quinoa for leaves.

Conclusions on the influence of cultivar, epoch and density on biometric, physiological and biochemical indicators in quinoa.

Conclusions on the influence of cultivar, epoch and fertilization on biometric, physiological and biochemical indicators in quinoa.

Titicaca and Vikinga cultivars are recommended for the most significant productions.

Chemical fertilization is recommended to obtain the most substantial amounts of leaves per hectare and ensure positive results in terms of quality.

The density of 7.7 million plants per hectare, is recommended because quinoa plants, until the phenophase of the appearance of the panicle, best capitalize on the cultivated area.

The Titicaca variety is recommended because it has accumulated the highest amounts of polyphenols and the Puno cultivar for its phytosterol content.