ABSTRACT

The cultivation of climbing garden beans (*Phaseolus vulgaris* L. var. *communis*) is widely spread in Romania, but on relatively small surfaces, in micro farms and country gardens. The fact that this culture is not proper for mechanical exploitation, its development on large surfaces, in industrial way was not possible in open field condition, but only in protected areas. This is also the reason why the technical and scientifically investment were smaller.

Spite, this type of crop was preferred by the rural community due to its rusticity and plasticity of pods quality, to the large period of harvest and to its superior production, when comparing to bush beans. In this condition a wide range of local populations was conserved/developed increasing the biodiversity of this specie.

In the last decades, the increased interests for the vegetable cultivation in sustainable system, including ecologic, biologic or organic, determined the necessities for studies in which different taxons that are best adapted for this type of cultivation, should be found. In this purpose, the climbing garden beans were considered specie with large aptitudes for ecologic cultivation.

In the same time, after 1980-1985 years, when the „official" Romanian assortment is enriched with two new varieties Aurie de Bacău and Verba, the idea of their promotion in the conventional cultivation system (if we include the greenhouses and tunnels) is born. These kinds of projects, of promotion on large scale of this crop, both in conventional and unconventional systems, increased the interests for the optimization or improvement of the cultivation technologies.

Some researches made at the Institute for Vegetable and Flower Research Vidra, and especially those on made at Vegetable Research Station Bacau, in the period of time 1984-1987, could not completely resolve the problem, some aspects remaining still unclear.

In the actual conditions of vegetable gardening from our country, the proposal of perfecting the technology of cultivation of garden climbing beans is with a high scientific and practical interest, being an objective necessity for completing the knowledge and also for the accomplishment of a performance vegetable gardening.

Taking in account the above statements and having the technical-experimental conditions from V.R.D.S. Bacau, as well as the opportunity of preparing a PhD thesis in the specialty vegetable gardening at the Horticultural Faculty Iassy, I have decided to bring a small contribution to the improvement of the cultivation technology of climbing garden beans, in order to increase the quality and quantity of production, in the conditions of our country.

In order to accomplish these goals, a series of objectives were targeted, through which to determine the influence of the major technological factors over the harvest: the cultivar, the epoch of crop establishment, the year of production (meteorological conditions), distance between nests and number of plants in nest. In the same time, I established as objective the understanding of interaction between some of the studied factors as well as the influence of the technical combination of theses factors.

The researches were organized in the period of time 2002-2006, at vegetable Research Station Bacau but they are also laying on my practical experience of more than 30 years as chef of farm and researcher, implicated in the cultivation of climbing garden beans.

The present thesis has more than 250 pages and is structured on six chapter, according with the recommendations established by the University of Agricultural and Veterinary Medicine Iassy.

The work has two parts; part I – Informing and scientifically documentation and part II – The result of scientifically researches.

The first part includes the following chapters:

- Chapter 1 - The actual stage of researches concerning the culture of climbing garden beans

- Chapter 2 - Environmental and ecologic conditions and their importance for the culture of climbing beans

Part II has four chapters, as it follows:

- Chapter 3 - Agrobiologic study of an assortment of varieties and local populations of climbing garden beans

- Chapter 4 - Researches regarding the production capacity of the assortment

- Chapter 5 - Researches regarding the influence of some technologic factors over the production at culture of climbing garden beans

- Chapter 6 - General conclusions and recommends

The bibliography includes a number of 60 titles cited in the thesis text.

The first chapter is focused on the importance, origin and area of cultivation of climbing beans, as well as on the biologic, ecologic and technologic particularities.

From the importance of the crop results the alimentary, agro-phyto-technical, economical-social importance as well as the risk factors. The garden climbing beans is cultivated especially for its pods that are consumed in soups, stew and other culinary purposes, including canings. The alimentary importance is due to its rich content in hidrocarbures (7,7%), proteins (2,4), mineral salts, fiber and vitamins. As plant in culture, the garden climbing beans can be cultivated in open field, greenhouses and plastic houses and is excellent as forerunner. The crop is pretentious and with high costs, but the harvest is big, on a large period of time and with a small perishability.

The origin of climbing beans is in the ancestral *P. aborigenus*, from Brasilia. Specie *P. vulgaris* was born in 7600 year a.H., in Peru, from where it "migrated" in Mexic. In Europe was brought by Columb (1993), and then by other navigators.

The common bean is cultivated almost everywhere in the world, occupying a surface of more than 27 million hectare, from which almost 870 ha belongs to garden beans (for pods). In Romania, the garden beans is known from the end of XVIII century, and now is cultivated on a surface of more 11000 ha, with a total production of more than 40.000 tone.

The biologic particularities refer essentially on the main anatomo-morphologic particularities, as well as to some development particularities. The garden climbing beans is an annual herbaceous climbing plant, with a vegetation period of 120-140 days; the pollination is autogame and the fruit is a pod that is consumed at the technologic maturity ("in green").

The ecologic particularities reveal the rusticity and ecologic plasticity of this plant, but it underlines the high requests for temperatures (thermopile plant) and the sensibility to droughts in the period of blossom and pod's formation.

The technology of cultivation is presented both for open field and for greenhouses or plastic houses. It is essential the fact that the technology of cultivation, t the level of now-a-day knowledge, must take into account the undetermined growing of plants, the large duration of vegetation as well as all the other biologic and ecologic particularities. The crop is established by direct sowing or by transplants, at a density of almost 20-30 thousand nests/ha; is palisaded, pinched and the harvest vary between 25-40 t/ha.

The chapter 2 is dedicated to the presentation of natural conditions in which the researches were developed. The pedologic and agro-chemical characterization revealed the fact that the plants of beans found favorable conditions for cultivation. The soil is a cambric cernoziom, moderate levitate, well provisioned with nutritive elements.

The climatic and meteorological conditions underline the fact that the climbing garden bean find favorable condition for cultivation but only if we ensure a supplementary water supply through irrigation. On short, the climatic conditions are typically for a continental temperate climate, with warm summers and hard winters. The media multi-annual temperature is 8-9° C, with large variations from one year to another, for the monthly and decadal values. The media multi-annual rainfalls vary between 415 and 542 mm.

Chapter 3 has as a main purpose to reveal information regarding the morphologic, physiologic and disease resistance, as well as the level of production. As biologic material we used an assortment of 10 varieties and local populations of climbing garden beans in the frame of a standard collection study

The obtained results pointed out the great morphologic and physiologic diversity within the studied assortment from which three varieties and a local population is remarked. Those varieties are different through the following characters: the variety Verba has a large production potential, a big pod (long and broad) and is green colored; the variety Aurie de Bacău is a variety with strong production

potential, a big pod, yellow colored; L-46 Bacău is a local population similar with Aurie de Bacău, but the pod is shorter and more broad and with red spots on the yellow pod, the variety Violetă de Iaşi is a variety with strong production potential (less productive than Verba) with long pod, almost cylindrical, with a violet color.

Chapter 4 resolves the problem of production capacity of the variety assortment from the "Official List" of varieties in Romania, in opern field conditions and in greenhouse. The targets were harvest's dynamic, early production and total production. The technology of cultivation was a standard one – recommended by the specialty literature

The results pointed out the fact that the production in open field echelon on a period of almost two months, from July 1 to August 31. As an early production on remark the variety Aurie de Bacău, with a multi-annual average of 26,10 t/ha, followed by the variety Verba. The total production demonstrated the performance of varity Verba, with a multi-annual average of 48,60 t/ha, followed by Aurie de Bacău, with a production of 44,57 t/ha.

The culture in protected area revealed the fact that the production is echeloned on a period of two months, but with a month early than the crop in open field. The highest early productions are accomplished by the variety Verba (17,57 t/ha), fact that demonstrate the vocation of this variety for the early greenhouse culture. Also, the same variety accomplish the highest total production, with a multi-annual average of 44,37 t/ha.

Chapter 5 analyses the influence of the studied technological factors over the production of garden climbing beans and also the optimization of those ones. The researches used as biologic material the four varieties from the Official List (Aurie de Bacău, Verba, Violetă de Iaşi and Dragomir). The experience was organized both in open field and in greenhouse, in 2003-2005 periods. The experience was organized in arrangements of sub-divided parcels.

The results of researches are structured on distinct subchapters for crops in open field and in greenhouse, and within it the results concerning the individual influence of the studied technologic factors and in results referring to the influence of combined factors.

The factor variety demonstrated to be the most important production factor both in open field conditions and in greenhouse. In open field the most valuable cultivar for an early production Aurie de Bacău, and for greenhouse, the variety Verba. For the total production in open field and greenhouse, the best variety was Verba.

The factor epoch is important and determines significant differences not only for the early production. The differences at total production levels are blurred between epochs.

The distance of nests on rows determined significant differences, the best distance being 40 cm.

The number of plants in nests confirms to be a highly important technological factor. Evidently, the optimal number is three plants/nest. Anyway the nest with one plant is not recommended because they induces productions under the average level of experience

The years of production, through the meteorological conditions doesn't prove to be important for the early or total production.

The combinations of technological factors, in generally, determined significant production differences

Regarding the combinations variety x epoch, the best combinations were between varieties Aurie de Bacău and Verba with epoch 20.04, in open field.

The combination variety x distance between nests revealed the fact that the highest early productions were accomplished at the combination Aurie de Bacău x 40 cm, and for total production the combination Verba x 40 cm.

The combination variety x number of plants showed that the varieties Aurie de Bacău and Verba, with three and two plants determine the highest harvests.

The relevant combinations are obtained through the combination of the factors epoch and distance between nests. The best productions were obtained in combination 20.04 x 40 cm.

Combination epoch x number of plants/nest determine increases of significant production in case in which the epoch in 20.04 and three plants in nest are utilized.

If on combine the factors distance between nests on rows and number of plants/nests the best combination 40 cm x 3 plants/nest.

In the last chapter (6) are presented the general conclusions of the thesis. The established objectives were fully accomplished. So, technical solutions were found, through which the studied factors can be optimized according with the best variants revealed by the thesis results.