SUMMARY Keywords: medicinal plants (Momordica

charantia L.), berries (Vaccinium myrtillus

L., Vaccinium vitis-idaea L.), antioxidant, hypoglycaemic, turbo-extractor.

The PhD thesis – "Biotechnologies for obtaining biological active concentrates from medicinal plants and forest fruits using protective processes", elaborated by doctoral candidate Erdelyi (Pop) Andrea, under the scientific coordination of prof. univ.Dr.Vamanu Adrian, within the Doctoral School of USAMV Bucharest, comprises 3 parts structured on: 7 chapters, 44 figures, 30 tables, 5 appendixes and the bibliography with 142 titles (of which 14 electronic sources).

The first part of the PhD thesis is entitled "Current stage of knowledge", he second part is entitled "Personal research", and the third part presents "Final conclusions".

In order to achieve the aim and objectives proposed in the PhD thesis, part I was structured on 2 chapters. The first chapter includes a documentary study on the role and importance of medicinal plants and forest fruits (brief history of the use of medicinal plants and forest fruits, general notions and plant-based preparations under which plants are administered). Chapter 2 includes "Current stage of knowledge regarding the importance of berries in the spontaneous flora of the Ericaceae Family (Vaccinium myrtillus L.și Vaccinium vitis-idaea L.) and of cultivated medicine plants from the Cucurbitaceae (Momordica charantia L.) Family".

Chapter 3 includes a documentary study of enzymatic extraction technologies - enzymatic extractive biotechnologies (aqueous extract with enzyme extracts from dried vegetal material, aqueous extract with extraction enzyme from the fresh or frozen vegetable material and plants for obtaining fluids and powders).

Based on the study of documentary was established research plan which includes: ✓Experimental research on the development of original plant-based medicinal herbs

and forest fruits with biotechnological processes; ✓ Demonstration of a relationship between the chemical composition (the biologically

active component) and the antioxidant and hypoglycaemic potential of the extracts from Momordica charantia L. (fruit), Vaccinium myrtillus L. (fruit and leaves), Vaccinium vitis-idaea L. (fruit and leaves), by in vitro methods;

✓Development of 2 own design facilities - turbo-extractor and steam infuser- to improve the quality of fluid or dry extracts;

VI

✓ Determination of physicochemical, antioxidant and hypoglycaemic activity of spray dried extracts;

PART II "Own contributions" includes the following chapters: Chapter 4 named "Working materials and methods", includes 5 subchapters:

- ▪"Submission of plant material taken in work", where the raw materials used in the development of new products based on medicinal herbs and berries-blueberry (Vaccinium myrtillus L.) leaves and fruit, bitter goud (Momordica charantia L.), cranberry (Vaccinium vitis-idaea L.) fruit and leaves (general presentation and features) are described;

- ▪"Technological processes and analysis methods", where it is presented how to obtain dry extracts, evaluation of hypoglycaemic activity, evaluation of antioxidant activity, determination of bioactive phytocompholes: total phenol content and content of flavonoids;

- ▪"Results and discussions" – are presented the results of the evaluation of antioxidant activity, activity, determination of total

phenols hypoglycaemic animals through UV- Vis spectrometric method, determination ofbioactive compounds-flavonoids and chlorogenic acid;

- ·"Conclusions".

- ·"Biotechnology and technological installations for obtaining extraction products and protective forms" – are presented to the machines used extracts from herbs and fruits of the forest, and the original phytotherapeutic products (the turbo-extractor and infuser – own design and the spray-dryer atomizer). Chapter 5 "Original product formulations" contains 4 sub-chapters, namely:

- ·Momordica capsules (Dry extract of bittergoud Momordica charantia L.);

- ·Momyrtidiab II 500 ml (aqueous extract frombitter goud Momordica charantia L. and blueberry Vaccinium myrtillus L.);

- ·Momyrtidiab capsules (Dry extract of blueberry Vaccinium myrtillus L. And bitter goud Momordica charantia L.).

- ·Cranberry (Vitis idaea fructus) capsules (full extract of Blueberry Vaccinium vitis- idaea L.) Experimental studies have led to the achievement of 4 original phytotherapeutical products, by means of technological processes and technologies of extraction and forms protective of three species: blueberry (Vaccinium myrtillus L.), bitter goud (Momordica charantia L.) and cranberry (Vaccinium vitis-idaea L.) with hypoglicaemiant, hypocholesterolemiant, immuno-stimulent, antioxidant and antiseptic action.

VII

Chapter 6 "Standards and technical specifications for product achievement" includes four sub-chapters:

- "Technical specification to obtain the product Momordica

capsules”; ➢ “Technical specification to obtain the product Momyrtidiab II”; ➢ “Company standard for the product Momyrtidiab capsules”; ➢ “Company standard for the product Cranberry (Vitis idaea fructus) capsules”.

Chapter 7 “Original contributions of the PhD Thesis” presents its conclusions on the originality of the thesis:

❖ Original installations – the turbo-extractor and infuser designed to enhance the quality of the dry or fluid extracts;

❖Technology for obtaining phytotherapeutic products – the development of biotechnological processes for obtaining extracts from berries from the Ericaceae family (Vaccinium Myrtillus L. și Vaccinium Vitis –Idaea L.) and cultivated medicinal plants from the Cucurbitaceae family (Momordica Charantia L.);

❖ ·The formulation of original products – the creation, from the stage of idea to finished product, of phytotherapeutic products, by corroborating the outcome of the analysis carried out within the study, with definite hypoglicemiant, hypocholesterolemiant, immune-stimultent, antioxidant, antiseptic action;

❖ ·Research results have been presented at scientific events and have been published in peer-reviewed journals indexed in the international databases. Part III named “Final conclusions” presents the conclusions of the research carried out and recommendations on the prospects for further scientific approaches that may be undertaken. The study presented for the first time the phyto-chemical, antioxidant and hypoglycaemic analysis of an enzymatic extractive process in the turbo-extractor. Thus in vitro studies have proved that products fromVaccinium myrtillus L. remain some of the most complex add-ons with various biological activities, regardless of the technology used. Compared to other studies that use enzymatic extraction methods, significant differences were observed ($p < 0.05$) between extracts. It can be

interpreted, according to the same studies, that the yield of hydrolysis of cell wall (even between fruit and leaves of some plants) is different. This type of extraction, which is based on use of enzymes, is more appropriate to be used for the degradation of polysaccharides present in the leaves, while the Peel is less susceptible to this treatment. Thus, the leaves contain several flavonoids structural types that will directly express the antioxidant and hypoglycaemic potential. Of the flavonoids identified, quercitin is the one influencing the most the antioxidant effect, which would be confirmed by

previous studies. Also, according to some previous studies, quercitin is responsible for the inhibitory action on the α-amylase.

As in other previous studies, one could not identify a direct correlation between the hypoglycaemic activity of the phenol and flavonoid content. The extract of Vaccinium myrtillus L. (fruit), by its routine contents, has significantly contributed to the work of the inhibition of α- glycosidase. The extracts analysed with a high content phenolic presented the highest antioxidant and hypoglycaemic activity. The antioxidant activity had a maximum correlation, in the case of leaf extracts (0.9), while fruit extracts presented a degree of correlation average to say the least with the two biological activities analysed. As in other previous studies, as a result of lawsuits resulting from extractive products complex phytochemical point of view, which determines a unique biological response.

For the manufacture of the product Momordica capsule 100% integral natural extract of Momordica charantia L. fruit was used on maltodextrine support. This dietary supplement is recommended to use preventative in healthy individuals with a tendency to increase blood glucose and curative in people with diabetes, because it contains vegetable insulin, given the role and improvement of cardiovascular and that generally accompany diabetes. Reduce fats and cholesterol in the

blood.

Momyrtidiab Syrup is a phytotherapeutic original product obtained from natural extract from the fresh fruit of Momordica charantia L. (tincture), natural extract of blueberry fruit (Vaccinium myrtillus L.) obtained by cold pressing, natural sweetener-extract from the herb Stevia rebaudiana Bertoni which can be used as an adjunct in reducing blood sugar naturally due to the components of action similar to that of insulin. It acts as hypoglycaemiant because of the two sources of vegetal, natural insulin, namely charantina, active substance from Momordica charantia L. And mirtiline b, in which it was identified the 3-glicoside of delphinindol, the 3- galactoside, of delphinidol respectively, mirtiline being referred to as "vegetable insulin" acting on the beta cells of the pancreas from endocrine is lets of Langerhans by producing an insulinic hypergenesis with blood glucose-lowering effect. Antocianosides of fruit improve blood microcirculation by providing the smooth muscle contraction and rhythm of the arterioles control the circulating blood flow. Again the antocianosides act on retinal enzymes accelerating the regeneration process of retinal pigments, enhance the eyesight especially during the night; in diabetic retinopathy, blueberry extract helps reduce the collagen synthesis in the retina and thus improve the clinical symptoms of the disease. Extracts of Momordica Charantia L. (aqueous natural extract, alcoholic extract) have been tested on animals and volunteers and its action was found as being hypoglicaemiant, regenerating the endocrine pancreas and restoring the pancreatic function which diminishes gradually due to daily insulin administration, helping the

body to use the hormone efficiently, but the following actions were also ascertained: medical, lipolytic, hypocholesterolemiant, masculine aphrodisiac, contraceptive, anti-cancer, antiviral, immuno-modulatory and cytostatic.

In order to obtain the product Momyrtidiab capsules the following

ingredients were used: natural extract of Vaccinium myrtillus L. and Momordica chrantia L. This composition of natural extracts with therapeutic properties acts as a natural hypoglycaemic due to the two sources of vegetable insulin: charantine, an active substance from the fruit of Momordica and mirtiline, active substance from the fruit of Vaccinium myrtillus L.. It relieves the conditions characteristic for diabetic persons, caused by a faulty peripheral circulation. It helps treat or relieve digestive infections, urinary tract infections, intestinal infections and rheumatic diseases. It restores weakened immune function as a result of long-term use of antibiotics or other medicines. It reduces fat and cholesterol in the blood, normalizing the two forms of cholesterol. It prevents or decelerates neurological disorders caused by aging; it is beneficial in relieving myocardial infarction sequelae, improves heart activity.

The product Cranberry capsules is obtained from full extract of Cranberry - 240 mg/ capsule. Cranberry capsules is a dietary supplement with an anti-inflammatory role for the uro- genital tract, an adjuvant in nutritional diet, having a depurative, diuretic, antiseptic and antioxidant action.

Two installations were conceived, designed and operated – the turbo-extractorand thein fuser in order to improve the quality of the dry or fluids extracts. The turbo-extractor is a stirrer with blades or knives made from austenitic stainless steel and develops a speed of 10000-12000 revolutions per minute, used for grinding plant material. The infuseris made of austenitic stainless steel and has a volume of 100 litres. It has 2 components: the mixing bowl and a stirrer or turbine. The stirrer is made up of a propeller in different angles at the end of a rod to which it is attached. The rod rotates at the desired speed, mechanically driven by an engine.