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# The Productivity of Some Valuable Medicinal Plants in Conditions of Water Stream Hydroponic

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## Abstract

At the IHP NAS RA it was developed and licensed new, modern system water stream hydroponics for the soilless production of different plant species using polymeric film, the benefits of which are low cost, more automated system and beforehand instructed program. Its varieties are continuous, gully and cylindrical hydroponics. The aim of research was to develop of effective biotechnologies for some plants important in medicine and food industry (*Mentha piperita* L., *Ocimum basilicum* L., *Salvia officinalis* L., *Bidens tripartita* L. and *Leonurus quinquelobatus Gilib*.). Cylindrical hydroponic system promoted the 1.3-2.9 times increase of productivity of *Mentha piperita* L., *Ocimum basilicum* L. and *Leonurus quinquelobatus Gilib*. and the 1.3-3.3 times rise of the output of mentioned cultural plants' essential oils (except of *Leonurus quinquelobatus Gilib*.), extractive substances, total flavonoids and tannins. *Salvia officinalis* L.'s productivity was increased 1.2-5.4 times in gully hydroponics. Continuous hydroponic system promoted the high accumulation of extractive substances in the plants of *Mentha piperita* L., *Ocimum basilicum* L., *Salvia officinalis* L. and *Leonurus quinquelobatus Gilib*. High productivity (1.3-1.6 times) of *Bidens tripartita* L. and 1.1-2.5 times output increase of polysaccharides, extractive substances, flavonoids and tannins in it were recorded in classical hydroponics conditions.

**Keywords:** Water stream hydroponics; Productivity; Medicinal plants; Secondary bioactivity compounds

## Introduction

Hydroponics/soilless cultivation of plants as a modern biotechnological method of the plants productivity increase, is more expedient for the land-poor, also water-poor countries, where there are thousands of hectares of unfavorable and unusable in agriculture saline-sodic, stony and sandy soils. But the creation of hydroponicums requires substantial initial investments, thus, the development of novel and cheap systems is one of the main tasks for increasing economic efficiency of plants soilless culture.

For this purpose in 2006-2007 at the IHP NAS RA in a result of the long-term studies it was developed and licensed new, modern system water stream hydroponics for the soilless production of different plant species using polymeric film (instead of hydroponicums with classic ferroconcrete plots) that joins the rank of already existed in the world known hydroponic systems with its low cost, more automated system and beforehand instructed program [1].

Water-stream hydroponics is based on the nutrient solutions automatically controlled periodically and irretrievable push shaped like a jet directly to the root-bearing stratum by providing the optimal air-water-nutrition regime required for the normal growth and development of plant. The usage of nutrient solution irretrievable push principle and closed ecological system excludes the environmental pollution minimizing the danger of diseases' bursts, spread of pests and weeds.

1. The water stream hydroponics includes following varieties:
2. Continuous (Patent of RA, No.1988 A2): smooth surface of land is covered with polyethylene bio-insulating film, which is entire sprinkled with some of substrate (gravel, volcanic slag, etc.) (particles of 3-20 mm) with 20-25 cm thickness. Plants nourishment is being done with the help of the dispencing polyethylene pipes (through holes on them) connected with the main pipe at a necessary distance.
3. Gully (Patent of RA, No.1989 A2): on the land area at a certain distance furrows are digged in 25-30 cm depth and in 35-40 cm width that are isolated from the soil layer with polyethylene film filled with some substrate.
4. Cylindrical (Patent of RA, No.1946 A2): polyethylene cylinders of 30-40 cm in diameter are filled with some substrate (volcanic slag, gravel, etc.) (particles of 3-20 mm).

The aim of the research is to develop the growth biotechnology and to give comparative description of productivity, content and output of bioactive substances of essential oil-bearing and medicinal plants (*Mentha piperita* L., *Ocimum basilicum* L., *Salvia officinalis* L., *Bidens tripartita* L., *Leonurus quinquelobatus Gilib*.) in conditions of new water stream (cylindrical, gully, continuous) hydroponics and classical hydroponics. The choice of above mentioned plants is not occasional. They have wide application in medicine, perfume and food industry.

*Mentha piperita* L., *Ocimum basilicum* L. and *Salvia officinalis* L. are the essential oil-bearing and medicinal plants belonging to the family Laminaceae. Plants leaves, and essential oils received from them are used for treatment. They are used during treatment of cardiovascular, gastrointestinal tract's, liver, gallbladder's diseases, atherosclerosis, chronic bronchitis, asthma, tonsillitis, gum bleeding and other diseases [2-6]. They have also high antioxidant activity and