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The optimization of the medical herb growing

Summary (Arial, font size 12)
New knowledges about Si, plant physiology and non-traditional methodologies give opportunity for huge progress in resolving of the aging problem. Today many government and private organization investigate the possibility to increase the time-period for active human life. It was found many natural and artificial substances, which can help for resolving of this problem. One of the most important problem is increasing the efficiency the intensive growing medical herb. The preliminary studies has showed the possibility to increase the content of active substances in medical plants via reinforcement the biochemical processes. Several medical plants were using in the experiment: bamboo, green tea, Astralagus and Fallopia. The special treatment was used and the content of active substances (resveratrol, epigallocatechin gallate, polysaccharides and monosilicic acids) were tested in dynamic. The obtained data has demonstrated that the application of the activated Si and special substances for activation of the biochemical processes has double positive effect. First the biomass of the tested plant was increased on 10-35% during 3-6 months of the experiment compare with controls. Secondary the content of active substances in the simplast of the cultivated plants also was increased on 20-50%.

Key words (aging, bamboo, green tea, astralagus, fallopia)

1 Introduction

The problems of aging, cancer, heart diseases and others require complex solution including health, dietary and cosmetic treatments. Plant syntheses numerous organic molecules for various purposes – defense, metabolism, stresses, proteins et al (Briskin, 2000, WHO, 1999). Some of these molecules has unique properties and can be used for human consumption (dietary supplements, improve immune system, protection or care of serious diseases et al.). It is not question that natural molecules are future for human medicine and cosmetic (Shahin et al., 2008). Unfortunately the natural production of bioactive molecules from plant is restricted by low concentration of these substances in plant (Chandra et al., 2006). The effective regulation of natural synthesis is not used today properly, because the mechanisms of these processes are very poor investigated. In the result, usually, chemical company duplicated natural molecules by artificial synthesis of similar molecules. However, human civilization technologies today can't yet completely simulate naturals processes. In the result the power of artificial duplicated molecules is not same as natural matters. The manufacturing of NATURAL molecules from special plants mostly limits by low knowledges about plant physiology.

New methodologies in plant physiology, which was recently investigated and successfully tested in California State University and Russian Academy of Sciences give unique approach for fast and precisely investigation of any biochemical process in plant cell, including natural synthesis of active molecules (Matichenkov et al, 2008). The investigation of the role and function of Si in plant physiology and defense system of plants contribute new opportunity for regulation of natural synthesis in plant cells (Biel et al., 2008). The preliminary studies have shown that using of active Si activates stress-ferment synthesis, including polyphenols at several times. The combination of the methodology for plant physiology investigation and Si-base technology for activation and stimulation of the stress-ferments synthesis by plant cell will allow to elaborate the technology for increase the natural productivity of natural molecules several times (Matichenkov 2008).

Another problem understands the algorithm for organization the production of the natural molecules. The growing of specific plant requires the specific soil-climatic conditions and specific geochemical situation (micro-and macronutrient balance). The knowledges about growing of specific plants is also limiting in modern agrochemistry.

1.1 Materials and Methods

Bamboo (*Bambusoideae),* Astragalus (*Astragalus membranaceus,* Green Tea (*Camellia sinensis*), and Fallopia (*Fallopia japonica)* were used in greenhouse testing. The special fertilization programm with active forms of Si were used in this tests. After greenhouse testing the biomass of plant were measured. The content of mono and polysilicic asids were tested in symplast and apoplast of the plant tissue. In additional the biochemicals substances (Polysaccharides in astralagus, epigallocatechin gallate (EGCG) in green tea, and resveratrol in fallopia) were tested in plant tissue as well.

2 Results

The application of the Si-rich materials increase the growth of the bamboo shoots and roots twice, comparison with control plants. The total content of Si in the bamboo under optimization of the Si nutrition was increased from 2.54% to 4.46% for roots, from 3.45% to 5.61 % for stem and from 3.97% to 5.78% in leaves. The content of monosilicic acid in the apoplast and symplast of roots, stem and leaves were measured in the beginning and in the end of the test (Table 1).

Table 1. Monosilicic acid in symplast and apoplast of the roots, stem and leaves of bamboo.

	Roots		**Stem**		**Leaves**	
	Apoplast	**Symplast**	**Apoplast**	**Symplast**	**Apoplast**	**Symplast**
	--------------------------mg/kg of fresh tissue-------------------------------					
Beginning of the experiment						
Control plants	380	420	224	280	480	580
Si-treated plants	375	418	231	281	479	580
End of the experiment						
Control plants	342	415	185	240	320	510
Si-treated plants	682	824	455	470	790	830
LSD_{05}	10	15	10	15	10	15

The reduction of the monosilicic and polysilicic acids in the control plants explained by washing of the soluble Si thought roots, when the wares solution was changed.

The Telomerase activity was be tested by determination of the Polysaccharides in symplast and apoplast in leaves of Astragalus. The content of the Polysaccharides in the roots, stem and leaves of the control and treated plants are present in the Table 2.

The optimization of Si nutirition and using of activated Si give possibility to increase the EGCG concentration in symplast and apoplast of tea plants (Table 3). The resveratrol in fallopia under optimization of the Si nutrition also was increased on 25%. The obtained data showed that active forms of Si play importnat function in the biochemical regulation in symplas and apoplast of plan. We suggested that polusilicic aicids can form matrix for controlling dublication of the organic molecules (Matichenkov, 2008). This mechnism explain, why the optimization of the Si plant nutrition increase the concentration of the tested substances.

Table 2. Polysaccharides in symplast and apoplast of the roots, stem and leaves of Astralagus.

	Roots		**Stem**		**Leaves**	
	Apoplast	**Symplast**	**Apoplast**	**Symplast**	**Apoplast**	**Symplast**
	-------------------------- g/kg of dry tissue -----------------------------					
Control plants	87.2	93.1	4.2	5.2	4.3	5.5
Si-treated plants	138.3	155.4	6.3	8.1	7.6	8.5
LSD_{05}	2.5	3.5	1.3	2.1	0.5	0.7

Table 3. EGCG in symplast and apoplast of the roots, stem and leaves of yang and old green tea plants.

	Roots		**Stem**		**Leaves**	
	Apoplast	**Symplast**	**Apoplast**	**Symplast**	**Apoplast**	**Symplast**
	-------------------------- mg/kg of fresh tissue -----------------------------					
Yang green tea plant						
Control plants	8	3	34	54	100	112
Si-treated plants	10	4	46	68	152	178
Old green tea plant						
Control plants	10	6	39	65	121	145
Si-treated plants	12	8	48	79	145	168
LSD_{05}	2	2	5	5	7	8

Table 4. Jatrophine in symplast and apoplast of the roots, stem and leaves of yang and old green tea plants.

	Roots		**Stem**		**Leaves**	
	Apoplast	**Symplast**	**Apoplast**	**Symplast**	**Apoplast**	**Symplast**
	-------------------------- mg/liter of sap -----------------------------					
Control plants	0.14	0.17	0.27	0.37	0.39	0.48
Si-treated plants	0.19	0.23	0.38	0.44	0.63	0.69
Si-microbial	0.22	0.29	0.48	0.53	0.87	0.95
LSD_{05}	0.04	0.04	0.04	0.04	0.04	0.04

The obtained data showed that it is available the possibility to regulate the methabolism of the plant cell by application of the active substances. It is importnat that active Si substances are environmnetally friendly and has not negative influence on the soil-plant-microbial system. The suggested technology can be used for reinforcement the growing of the medical herbs. This give possibility to increase the productivity without reduction of the product quality.

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