International Conference

Vaccinium spp. and Less Known Small Fruits: Cultivation and health benefit

and

COST 863 Euroberry Research: from Genomics to Sustainable Production, Quality and Health, Joint Meeting WG 3&4

Dedicated to 65th anniversary of prof. Ján Matuškovič

Book of abstracts

organized by

Institute of Plant Genetics and Biotechnology,
Slovak Academy of Sciences, Nitra, Slovak Republic

and

Fac. of Horticulture and Landscape Engineering, Dept. of Pomology, Viticulture and Enology, SUA Nitra, Slovak Republic

and

Grassland and Mountain Agriculture Research Institute in Banská Bystrica of SARC, Krivá na Orave Research Station, Slovak Republic

September 30 – October 5, 2007, IPGB SAS, Nitra, Slovak Republic

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ISBN 978 - 80 - 89088 - 58 – 4

FEATURES OF BIOCHEMICAL COMPOSITION OF *Vaccinium corymbosum* L. FRUIT WHEN INTRODUCED IN BELARUS

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In connection with research into the adaptive potential of *V. corymbosum* L. upon its introduction into southern regions of Belarus an assessment of the biochemical composition of fruit of 3 model highbush blueberry varieties - Duke (early-ripening), Bluecrop (mid-ripening) and Nelson (late-ripening) on 43 values has been given in the frames of a field experiment with the 8-alternative scheme of N60, P60, K60 application (kg/hectare a.s.) on an admixture of high peat and sod-podzolic sandy loam soil in a 4-years cycle of observations.

As a result of investigations the most evident varietal differences in the content of separate compounds have been found. The degree of their display was appreciably determined by the hydrothermal regime of a season and mineral status. It has been shown that highbush blueberry fruit, especially those of the early ripening variety, are extremely rich in phenol compounds possessing a wide action spectrum on the human body. The total content of bioflavonoids (P-vitamins) in 100 g of fruit dry matter averaged 4550…6830 mg, including anthocyans properly – 5…10, leucoanthocyans – 17…28, catechins – 1160…1580, flavonols – 3280…5210 mg. The content of tanning agents and lignins thus averaged 1.4…2.4 and 4…15 respectively. In separate seasons the marked varietal differences were registered as regards accumulation of phenolic compounds in fruit (basically within the range of 10…30 %) which degree of displaying was determined by the total quantity of incoming heat during fruit ripening. Decreasing the provision of heat in the course of the experiment promoted the activation of bioflavonoid accumulation in fruit of the early-ripening variety against the background of reduced contents of lignins and, to a lesser degree, of tanning agents which resulted in emergence of appropriate differences between this and two other varieties. The increased supply of heat in the referenced period promoted a marked leveling of those differences.

It has been shown that highbush blueberry fruit are characterized by several times higher activity of polyphenol oxidase rather than peroxidase against the background of rather weak dependence of both ferments activity on a varietal identity of plants, mineral background and geographical location of the research area.

The variation range of organic acid and terpenoid content in dry matter of highbush blueberry fruit under the combined influence of exogenous factors made up: for titrate acids (in terms of lemon acid) – 2.6…9.9 %, ascorbic, benzoic and phenol carboxylic acids – 276…923; 138…348 and 1584…1916 mg of % respectively; for triterpene acids – 1.8…3.1 %, fatty oils – 2.7…4.9 %, carotenoids – 3.1…6.8 mg of % incl. β-carotin – 0.3…1.2 mg of %. Dry matters accounted for 13.9…16.9 % in fresh highbush blueberry fruit. It has been shown that the fruit of the mid-ripening variety are in general characterized by the highest values of averaged (in a long-term observation cycle) parameters of accumulation of the majority of listed substances – benzoic and phenol carboxylic acids, fatty oils and carotenoids. The fruit of the early-ripening variety displayed the highest values for ascorbic and triterpene acids while those of late-ripening plant – for free organic acids and dry matters. At this point the less marked character of varietal differences in perennial cycle (with divergence in extreme values by no more than 10-20%) has been registered for ascorbic, benzoic, phenol carboxylic and triterpene acids, as well as fatty oils, while the most marked character (with more than 100% values divergence) - for free organic acids and β-carotin. The intermediate position in this regard was occupied by xanthophylls – with a relative scale of maximum varietal differences within the range of 30…50%.

The analysis of the carbohydrate composition of highbush blueberry fruit in the long-term observation cycle against the background of introduced mineral fertilizers has shown that depending on weather conditions during the ripening period and on the varietal identity of plants, the content of some substances in plant dry matter averaged: 19…27% as regards soluble sugars – with the absolutely dominating position of monosaccharides, first of all fructose; 3…6% for pectic substances – with pectin prevailing; and 5.8…7.9% for cellulose. It has been shown that against the background of lacking varietal differences in the aggregate content of soluble sugars in fruit, the late-ripening variety was dropping behind the two other varieties by 10…30% in glucose accumulation while overtaking them by 20…30% in the case of saccharose. At the same time it was characterized by the lowest content of pectin substances in its fruit yielding to the mid-ripening variety (the one with the highest content) by 12…28%. A gradual increase of the sugar-acid index has been registered reflecting the sweetness of fruit that was growing from late- to early-ripening varieties. A degree of dependence of varietal differences occurrence in carbohydrates accumulation in highbush blueberry fruit on the hydrothermal regime of their ripening period has been established.

The following variation ranges for the parameters of accumulation of major mineral elements in fruit have been given (%) – N – 0.62…1.73; P – 0.03…0.38; K – 0.38… 0.67; Ca – 0.05…0.13; Mg – 0.02…0.04; microelements ($mg.kg^{-1}$) – Fe – 22.7…55.6; Mn – 7.5…36.2; Zn – 1.2…7.1; Cu – 1.5…3.4. It has been shown that the elemental composition of highbush blueberry fruit is determined by the hydrothermal regime of a season and formed at the expressed inconsistency of N, P, K supply rates on the one hand, and Ca, Mg – on the other, and also with a similar inconsistency of supply as regards Fe and other microelements. A decrease in the temperature background in combination with lack of moisture resulted in the weakening of synergism between accumulation of K on the one hand, and both N and P on the other hand.

Within the frame of the general methodical approach a comparative research into resistance of biochemical components of highbush blueberry (model varieties) fruit to the global influence of meteorological factors on the basis of their average variability level analysis in a long-term cycle of observations allowed to designate a position for each of them in regard to the decreasing degree of such resistance. It also has shown that against a background of marked varietal differences the minimal variability values (V below 15 %) and hence the lowest dependence on the hydrothermal regime of the vegetative season, were characteristic for the parameters of accumulation of dry matters, leucoanthocyans, catechins, flavonols, phenol carboxylic acids, fructose and cellulose in fruit. The average dependence (V=15…30 %) was characteristic for properly anthocyans, tanning agents, triterpene acids, fatty oils, xanthophylls, saccharose, pectic agents, potassium and magnesium. The highest dependence (V> 30 %) was registered for lignins, free organic, ascorbic and benzoic acids, β-carotin, nitrogen, phosphorus, calcium, microelements, and also for the sugar-acid index value.

On the basis of research into the average level of variability indices of biochemical composition of fruit in separate years in the frames of a field experiment, providing a notion of the degree of their resistance to the edaphic factor, it has been established that the dependence of parameters of accumulation of useful substances on the state of mineral background is less marked, on the whole, than their dependence on meteorological factors. The majority of parameters were characterized by a low degree of the given dependence. The average level of the latter has been established for the content of macroelements, Mn, anthocyans, titrate acids, xanthophylls, saccharose, hydropectin and the sugar-acid index values, whereas the high level – only for β-carotin and microelements. Thus it has been shown that the ratio of influence exerted by meteorological and edaphic factors in the formation of the biochemical composition of highbush blueberry fruit in a field experiment was determined by the chemical nature of its separate elements and varietal identity of plants.

References

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