CALITATEA FRUCTELOR LA UNELE GENOTIPURI DE AFIN
FRUIT QUALITY CHARACTERISTICS OF SOME BLUEBERRY GENOTYPES

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Abstract

In Romania the blueberry breeding program started in 1982 and till now was conducted by dr. Paulina Mladin. For inducing the variability, different genetic resources of American blueberry cultivars (*V. corymbosum, V. angustifolium*) were involved in a high number of crosses. For identify the genotype with the best fruit quality, some biometric quality indicators (average fruit weight, size index) and basically chemical compounds of fruits including ascorbic acid, dry matter, ash, soluble solids, total sugar, titratable acidity, tanoid substances, pectic substances, protein crude, phosphorus and potassium were determined. Of the eleven chemical studied properties who reflected the fruits quality, for five of them were found no statistically significant differences. The purpose of this paper work was to evaluate fruit quality and to identify the valuable genotypes resulted from Romanian blueberry breeding program.

Cuvinte cheie: fructe**,** compozitie chimică, determinări biometrice
Keywords: blueberry fruit, chemical content, biological measurements

1. Introduction

America is the native continent of the highbush blueberries (*Vaccinium corymbosum* L.), this tetraploid species (2n = 4x = 48) is the most cultivated species in all temperate parts of the world. The american blueberry breeding program in the last 60 years, has been developing cultivars with low winter chilling requirement. Also, breeding programs around the world are facing challenges placed on them by their market place, production regions and funding and are responding to create cultivars that successfully meet the needs of the marketplace (Finn C., 2008). In Europe, the blueberry cultivation was started in 1928, (Hancock Jim, 2006; Clark, 2006) but this culture has developed as industry in the last 20 years (Strik B., 2004). Highbush blueberry (*Vaccinium corymbosum* L.) growing in Romania started in 1967 (Botez M. et al, 1984, Mladin Paulina, 1998) but on a commercial scale was developed in the 2000's (Chitu V., 2012).

In our country, the highbush blueberry breeding program has been conducted since 1982, by Paulina Mladin, at RIFG Pitesti, having the aim the obtaining of new cultivars well adapted to the Romanian ecological conditions (Mladin, 2008). The main objectives of this program were high yield and quality, extending the ripening season, good plant habit and evenness in ripening for the easy of picking (Mladin P., 2010). For inducing the variability, different genetic resources, mainly American highbush blueberry cultivars were involved in a high number of controlled crosses and open hybridizations. The berry quality became an important objective. the size, color, bloom, taste and biochemical content were the selection criteria for the new genotypes. Later, prolonged shelf-life, picking, transport and storage resistance were added to the objectives. (Mladin P., 2010). The purpose of this paper work is to evaluate fruit's quality and identify the valuable genotypes resulted from Romanian blueberry breeding program.

2. Material and methods

The field experiment was conducted at RIFG Pitesti, Romania on a flat land, on the 3nd terrace of the Doamnei River, during 2009-2011. It is an alluvial soil which on 0-20 cm depth showing the following properties: clay content, Ø < de 0.002 mm (C)=17.7%; organic matter (H)= 1.82%; pH_{H2O} =5.6. On the 20-40 cm depth, these properties had the following values: C= 20.0%, H=1.72%, pH_{H2O} =5.6 (Ancu I, 2010). The blueberry was planted in the fall of 1995. The plants were spaced 1 m apart in the row and 2.8 m between rows, according to the following experimental scheme: A Factor - genotypes, with sixteen graduations: a_1-'13-3-8/83'; a_2-'15-36-9/8'; a_3-'4/40-3-83', a_4-'3/84'; a_5-'4/48-3-83'; a_6-'7-2-2/83'; a_7-'5-47-3/83'; a_8-'4-50-3/83', a_9-'24-1-83'; a_{10}-'DXC5-69'; a_{11}-'5/40-3-83', a_{12}-'E3/17', a_{13}-'5/12-2-83', a_{14}-'E3/16', a_{15}-'Bluecrop', a_{16}-'Blueray'. The experiment was organized in randomized blocks in 4 replications (6 plants per replication). For quantifying the fruit quality characteristics, some biometric fruit quality indicators (average fruit weight (g), size index (cm),) and basically chemical compounds of fruit including ascorbic acid, dry matter, ash, soluble solids, total sugar, titratable acidity, tanoide substances, pectic substances, protein crude, phosphorus and potassium were determined. Biometric indicators were determined by measuring each fruit with a caliper. The index size of the fruit was calculated by formula: (height + large diameter + small diameter)/3, (Botu and Botu, 1997). Ash content was determined by combustion of aliquat (10 g of fresh fruit tissue) at 550-600°C. Dry matter was determinate by gravimetric method. The total sugar content was determined by Fehling – Soxhlet titrymetric method, organic acid content was determined by titration, pectic substances were determined by gravimetric method after precipitated saponificated substances with alcohol 90% and natrium hydroxide 10%. Protein crude was determined by Kjeldahl method; the tanoid substances were determined by Lawenthal Neubeur method. Phosphorus and potassium contents were determined by flame fotometer-type Flapho 4. The results were statistically calculated using ANOVA-method.

3. Results and discussions

Fruit size expressed in this paper work by the average fruit weight and size index are the major characteristics who evaluate fruit quality when they reach the consumer.

Evaluation of fruit in terms of biometric traits, average fruit weight respectively highlighted selection '13-3-8/83', '15-36-9/8' and '4/40-3-83'. These selections registered higher values of 3g/fruct, and thus were significantly higher by 47% versus to standard varieties 'Blueray' and 'Bluecrop'. Of the sixteen genotypes studied, the selection '13-3-8/83' recorded the highest value of fruit average weight 3.25 g/fruit (fig.1). Analysis of the other biometric indicator of fruit quality studied, the fruit size index divided studied selections into five statistically classes. The highest values of index size were recorded at the same selections '13-3-8/83', '15-36-9/8' and '4/40-3-83' as within the average fruit weight (Fig. 1), this selections have the biggest fruits (fig.2). One of the most important features determining genotypes suitability for consumers is biochemical content. Thus, the genotypes fruit quality was chemically assessed by analyzing eleven biochemical indicators. The resulted obtained showed that from all studied genotypes the selection '4-50-3/83' had registered the highest value 10.7 mg% of calcium content (fig. 3). The selection 'E3/84' had recorded the highest content of ascorbic acid, but the lowest value was recorded to the selection '5/12-2-83' and 'Bluecrop' cultivar. These two genotypes showed significantly lower values by 15 - 50% versus all studied genotypes (fig. 4)

Previously, water content in blueberries was estimated at 80.1-87.7% by Adams, 1975, and at 83.2% by Skupien, 2006. In our experiment the evaluation of dry matter fruits content had showed no statistically assured differences between the studied genotypes, but the highest value was recorded by '13-3-8/83' (16.2%) selection and the lowest value by 'Blueray' cultivar (12.0%) (fig. 5).

Averaged over the three years of study, the selections 'E3/16' and '13-3-8/83' had recorded the highest content of total sugar, respectively 12.7 and 14.4%, the differences being statistically assured versus the others studied genotypes (fig. 6).

The literature previously reported that, blueberry have the total acid content between 0.51-1.77 g 100 g-1 of citric acid (Adams, 1975). In our study, significant differences were found only between same selections regarding the total acidity (% malic acid) of berries. The highest values of total acidity were recorded by E3/16 and 5/12-2-83 selections, compared with 'Blueray' standard cultivar differences being statistically assured (13%, fig. 7).

The studied genotypes showed no statistically assured differences of the following chemical characteristics: dry matter (fig.5) ash content (fig.8) tanoid substances content (fig. 9) pectic substances content (fig. 10) and crude protein content (fig. 11). Evaluation of fruits phosphorus content, highlights that 'Bluecrop' cultivar recorded the highest phosphorus fruits content 35mg%, and together with the selections from the same statistic class ('4/40-3-83' and 'DxC5-69') had recorded significant differences by 45% compared to all studied genotypes (Fig. 12). In Figure 13 we have shown the average values of fruits potassium content and had remarked that the highest value was recorded by 'DxC5-69' selection and the lowest potassium content was recorded by '13-3-8/83' selection.

4. Conclusions

The blueberry selections '13-3-8/83', '15-36-9/8' and '4/40-3-83' had registered values of average weight over 3 g per fruit.

Of the eleven chemical properties studied (calcium, ascorbic acid, dry matter, ash, soluble solids, total sugar, titratable acidity, tanoid substances, pectic substances, protein crude, phosphorus and potassium) who reflected the quality of the fruit, for five of them (dry matter, ash content, tanoid substances content pectic substances content and crude protein content) where found no statistically significant differences between studied genotypes. Thus, regarding the calcium content of the fruit, the selection 4-50-3/83 had recorded the highest content of calcium (10.7 mg%), and the large amount of crude protein (0.62%), versus other studied genotypes .

The highest phosphorus content was recorded by ‘Bluecrop’ cultivar, the selection ‘4/48-3-83’ recorded the highest content in pectic substances (0.51%) and ‘DxC5-69’ recorded the highest tanoid substances content (0.49%), but the highest ash content was recorded by fruits selection ‘7-2-2-83’.

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Figures

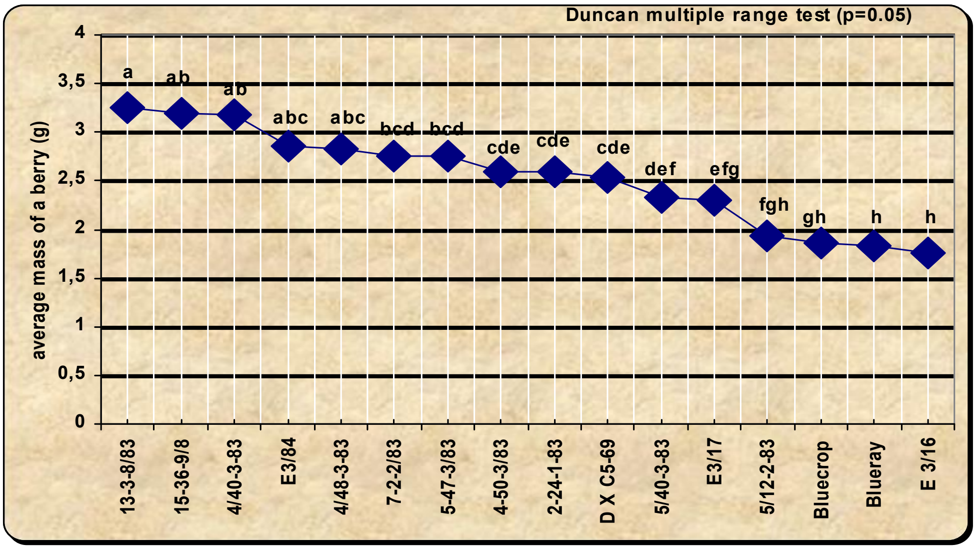

Fig. 1. Average fruits weight

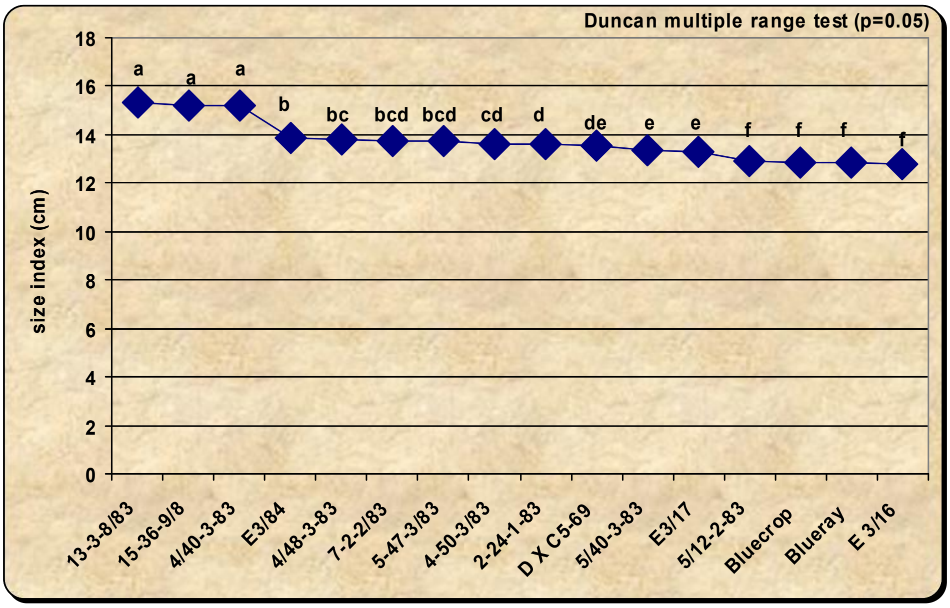

Fig. 2. Fruits size index

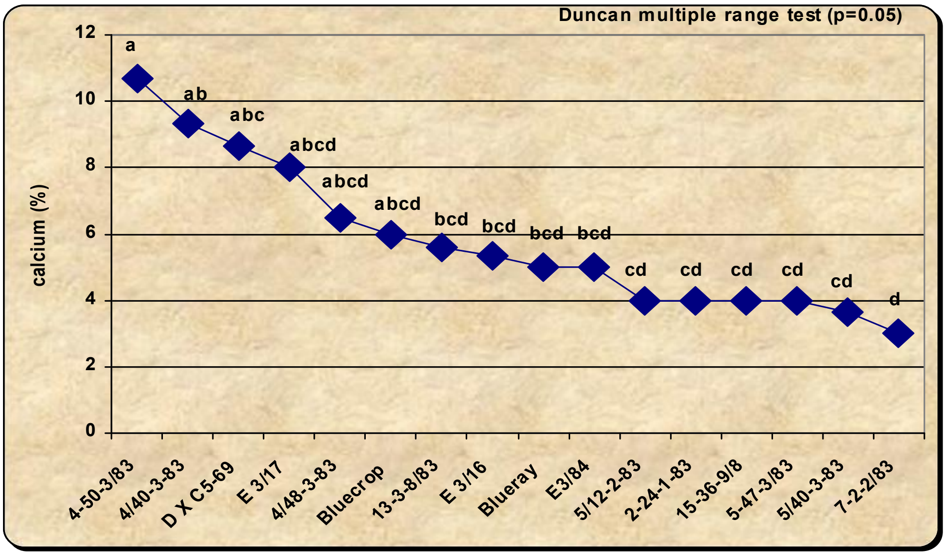

Fig. 3. Fruits calcium content

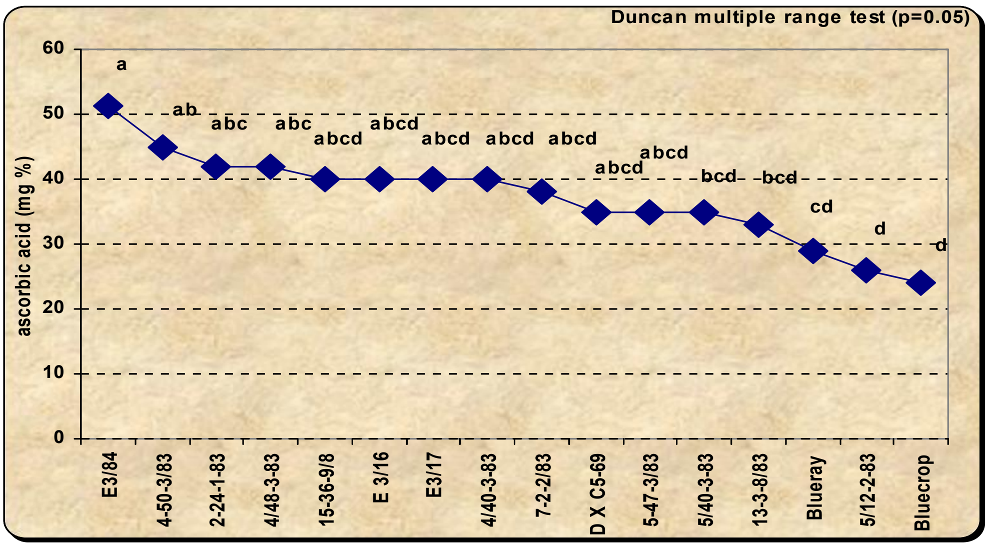

Fig. 4. Fruits ascorbic acid

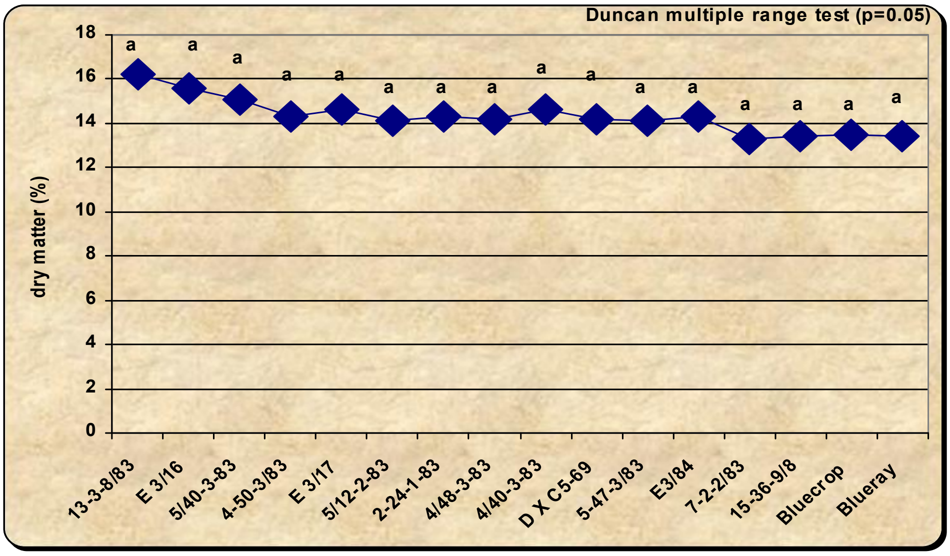

Fig. 5. Fruits dry matter content

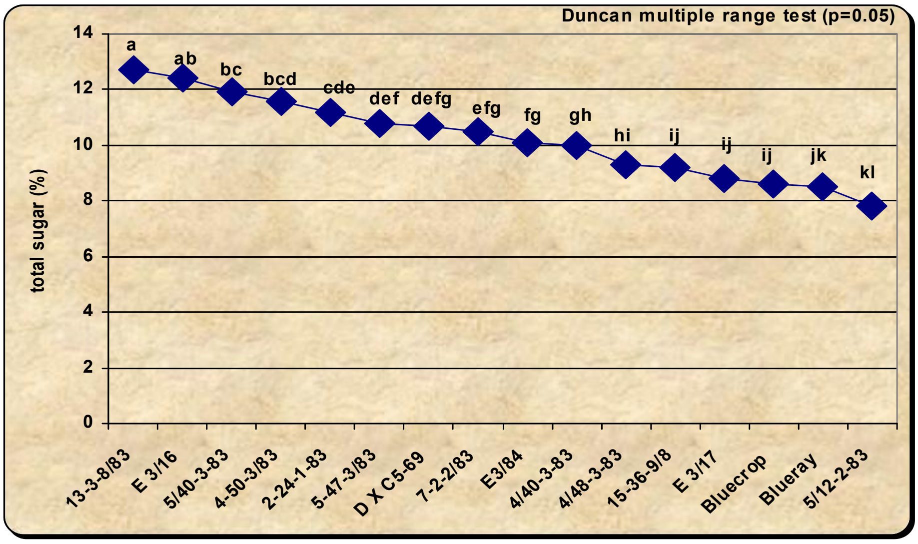

Fig. 6. Fruits total sugar

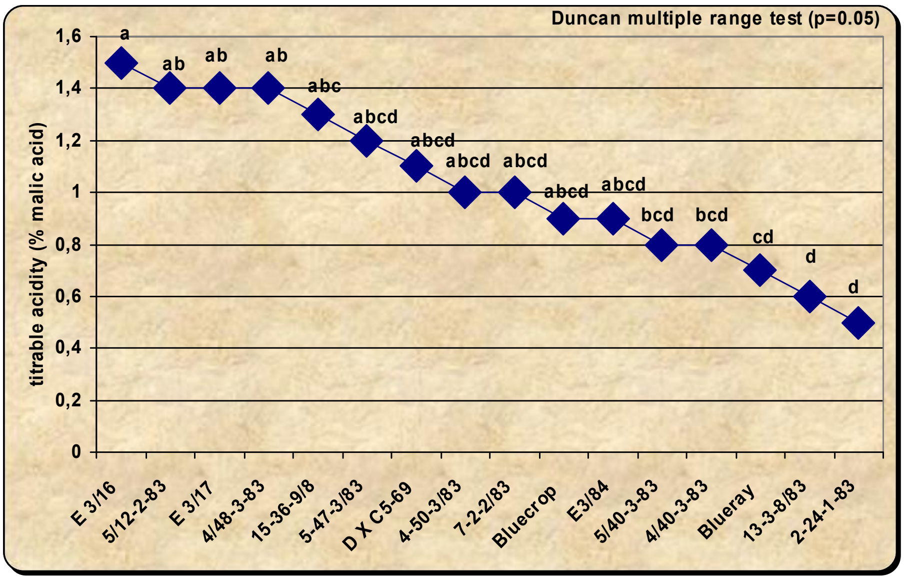

Fig.7. Fruits total acidity

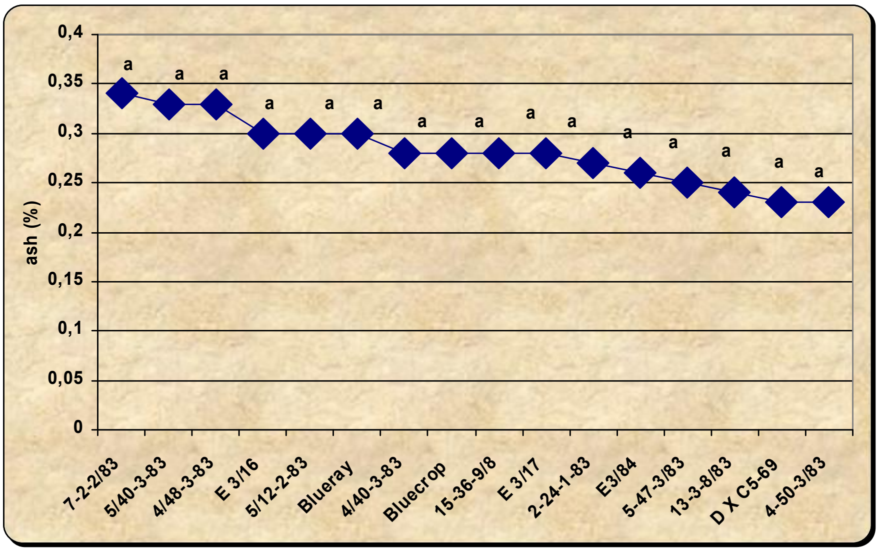

Fig. 8. Fruits ash content

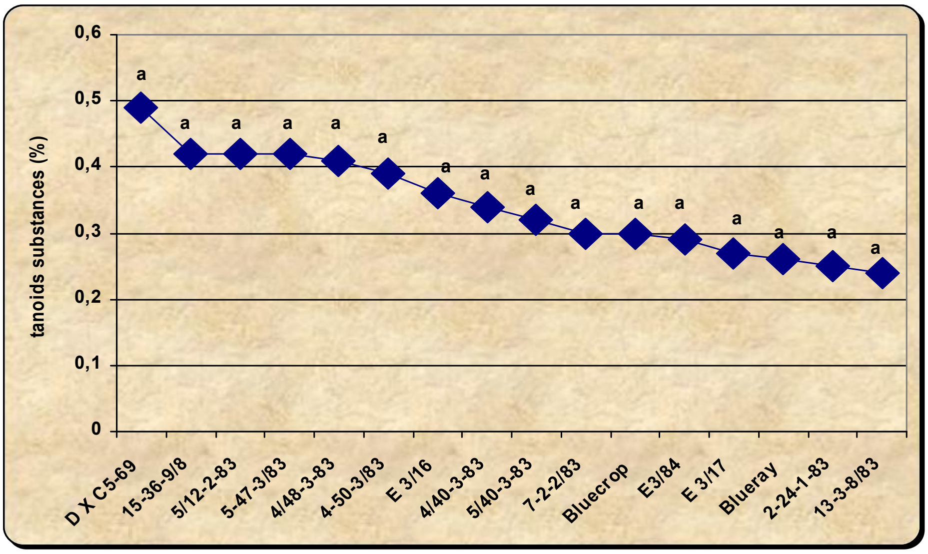

Fig.9. Fruits tanoid substances content

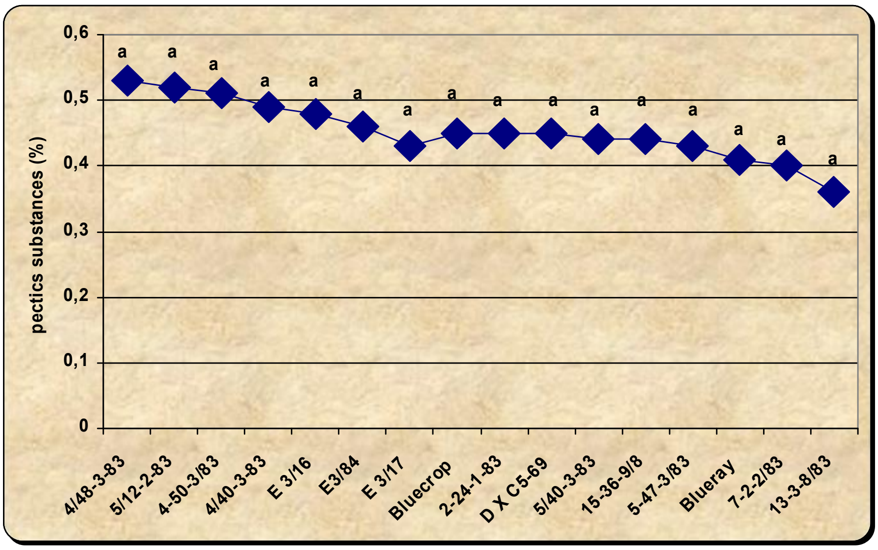

Fig. 10. Fruits pectic substances content

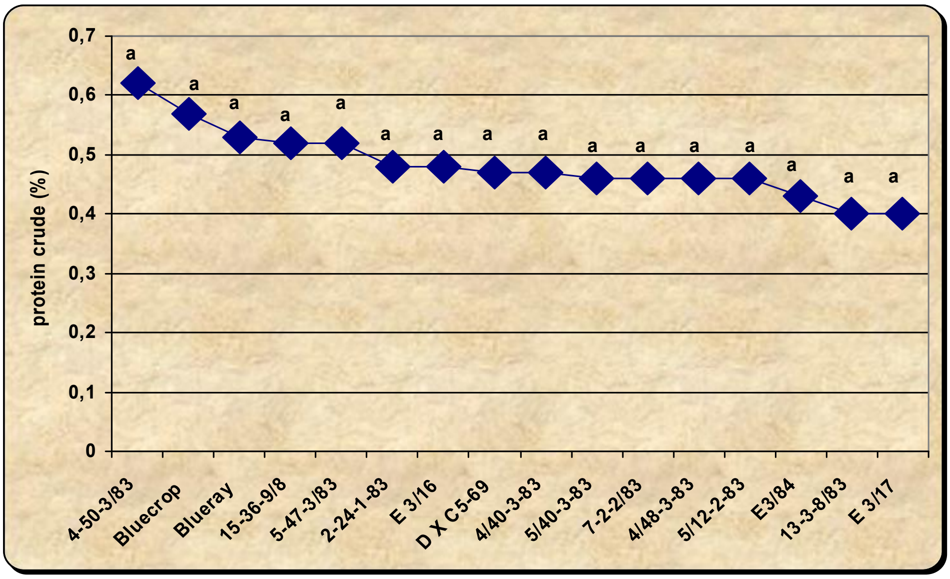

Fig. 11. Fruits protein crude content

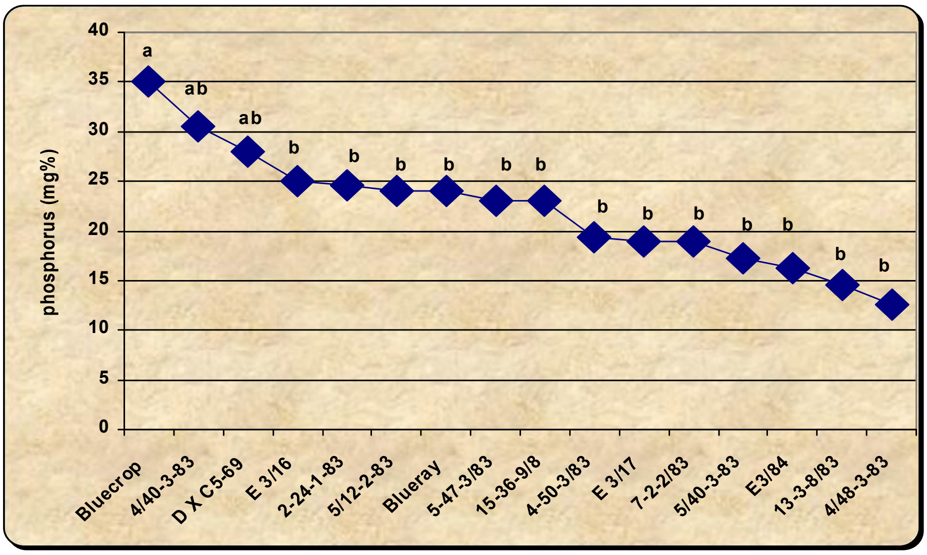

Fig. 12. Fruits phosphorus content

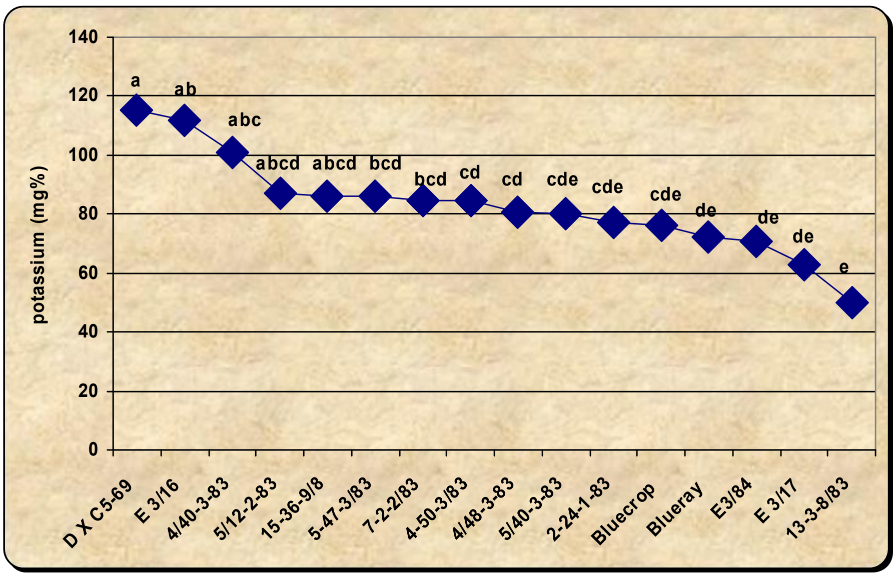

Fig. 13. Fruits potassium content