Inhibition of α-glucosidase by polyphenols present in traditional, indigenous apple varieties

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Abstract

This work aimed to evaluate polyphenols from two traditional apple varieties as α-glucosidase inhibitors. Polyphenols were extracted from the flesh and skin of two traditional apple varieties (Božićnica and Batulenka) by using ultrasonic-assisted extraction. Total polyphenols in extracts were determined by the spectrophotometric Folin-Ciocalteu method, expressed as gallic acid equivalents (GAE). The α-glucosidase activity was evaluated based on the spectrophotometric determination of *p*-nitrophenol (pNP) released from *p*-nitrophenyl-α-D-glucopyranoside (*p*-NPG) substrate by the action of the enzyme. To inhibit enzyme activity, various polyphenol concentrations were added into the reaction mixture. IC_{50} value was calculated (concentration of polyphenols that gives 50 % inhibition). Božićnica and Batulenka contained 337.24 and 202.17 mg GAE/kg in the flesh and 2132.91 and 824.43 mg GAE/kg in the peel, respectively. Polyphenols inhibited α-glucosidase activity and inhibition reached a steady state. IC_{50} values, expressed as μg of gallic acid equivalents (GAE) per mL of reaction solution, of the flesh of Batulenka and Božićnica were 1.69 and 1.47, respectively. Peel showed similar IC_{50} values (1.07, and 0.33 μg GAE/mL, for the peel of Batulenka and Božićnica, respectively). These results suggest that polyphenols from the flesh and skin of traditional apple varieties are potent inhibitors of α-glucosidase activity.

Introduction

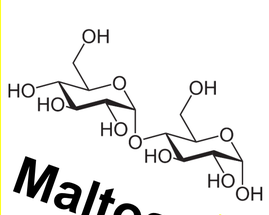
Traditional apple varieties

Božićnica

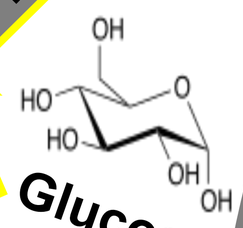
Batulenka

Good source of polyphenols

Inhibitors



Maltose



Glucose

α-glucosidase

Potential antidiabetic effect

Methodology

Extraction of phenolic compounds

Peel

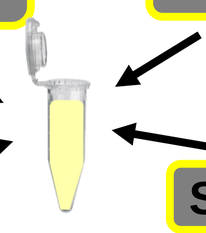
Flesh

Ultrasonic-assisted extraction

Total polyphenols determination

Folin-Ciocalteu reagent

Na_2CO_3



Water

Sample

Inhibition of α-glucosidase

α-glucosidase

Buffer

Supstrate (pNPG)

Extracts

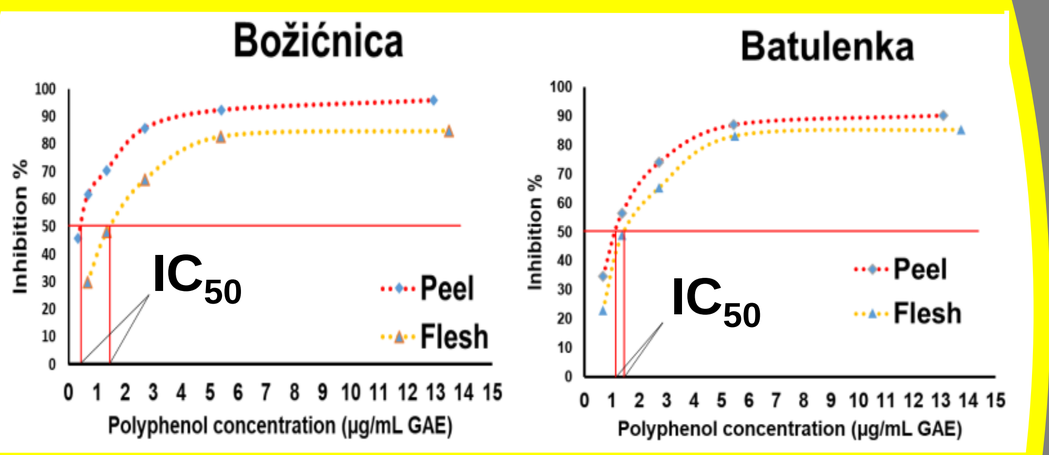
Incubation

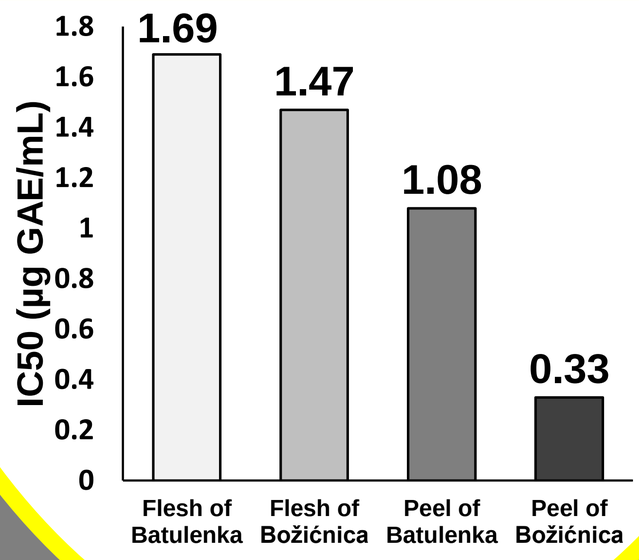
Determination Of pNP

Results

Polyphenol source	Weight (g)	Total polyphenols (mg/L)[a]	Polyphenol content[b]
Flesh of Batulenka	4.4	166.5	202.2
Flesh of Božićnica	4.3	272	377.2
Peel of Batulenka	4.3	610.2	824.4
Peel of Božićnica	4.3	1425.6	2132.9

[a] Mean values of total polyphenols obtained by the Folin Ciocalteu (FC) method based on two extracts each measured once (n = 2)
[b] Mean values of polyphenol content expressed in mg gallic acid equivalent per kg of fresh flesh/peel weight





Conclusion

1) The polyphenolic extracts from flesh and the peel of two traditional, indigenous apple varieties, strongly inhibit α-glucosidase
2) Peel of Božićnica is the most potent inhibitor
3) Polyphenols have potential to retard hydrolsis of olygosaccharides by inhibiting α-glucosidase activity

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HRZZ Croatian Science Foundation