Adsorption of Syringic Acid onto Barley ß-Glucan: Adsorption Kinetics, Antioxidant Activity, and FTIR Analysis

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Abstract

Syringic acid belongs to the group of polyphenols and is known for its biological properties, including antioxidant activity. β-Glucans are dietary fibres with potential functional and biomedical applications, and their interactions with polyphenols may influence the stability, availability, and biological activity of polyphenols. Therefore, studying the interaction between syringic acid and β-glucan may provide useful insights into their behaviour. The aim of this study was to investigate the interaction between syringic acid and β-glucan during the adsorption process over time at pH 7.0 and 37 °C. Pseudo-first-order and pseudo-second-order kinetic models were applied, and the half-reaction time was determined. In addition, the antioxidant activity of syringic acid and the syringic acid–β-glucan mixture was determined using the DPPH$^{\cdot}$ method. FTIR spectra were recorded for syringic acid, β-glucan, and the syringic acid–β-glucan complex. The results showed that syringic acid was adsorbed onto β-glucan, with an adsorption capacity of 339 mg g^{-1}. The apparent adsorption rate constants were 5.89 h^{-1} for the pseudo-first-order model and 0.059 g mg^{-1} h^{-1} for the pseudo-second-order model. No statistically significant differences were observed between the EC_{50} and ARP values of syringic acid and the syringic acid–β-glucan mixture. The FTIR spectra confirmed the adsorption of syringic acid onto β-glucan and indicated possible interactions between functional groups of both compounds.

Keywords

Syringic acid, β-glucan, adsorption, adsorption kinetics, antioxidant activity

1 Introduction

Polyphenols have been increasingly studied in recent years due to their beneficial effects on human health. Among the various polyphenolic compounds, syringic acid (Fig. 1) has attracted attention because of its presence in various plant-derived foods and products, such as honey, pumpkin, spices, grapes, olives, and beverages like red wine, dark beer, and other. Syringic acid is a naturally occurring phenolic acid that has been reported to exhibit numerous bioactive properties, including antioxidant, anti-inflammatory, anticancer, antimicrobial, and antidiabetic effects. Owing to these health-promoting properties,[1] syringic acid has been investigated for its potential role in disease prevention and in the development of functional foods and nutraceutical products.[2–4] Despite the reported bioactive properties of syringic acid, its absorption may be limited, which can reduce its bioactivity.[3,5] One way to increase the bioaccessibility of syringic acid is through adsorption onto dietary fibres such as barley β-glucan (Fig. 1). β-Glucan can carry syringic acid through the gastrointestinal tract and may possibly increase its bioaccessibility. Dietary fibres have been investigated in recent years due to their beneficial effects on human health, including the reduction of cholesterol and blood glucose levels, as well as their positive effects on immune system function.[6,7] Among the different types of dietary fibres, barley β-glucan can be used in the development of functional foods.[7] Due to the numerous beneficial properties of syringic acid and its widespread occurrence in various fruits, vegetables, and food products, this study investigates the inter-action between syringic acid and β-glucan.

Interactions can be explained by the adsorption process[8] in which syringic acid acts as the adsorbate and β-glucan as the adsorbent. Adsorption kinetic models can be applied to describe the adsorption process[9], including pseudo-first-order and pseudo-second-order models. Previous studies have shown that dietary fibres can act as carriers of bound polyphenols. Since polyphenols exhibit antioxidant activity[10], monitoring changes in antioxidant activity during their binding to β-glucan may provide valuable insights into the properties of syringic acid and the resulting complexes. Antioxidant activity can be measured using different methods, such as the DPPH method.[11] In our previous work, we studied the adsorption of syringic acid onto dietary fibres of algal and fungal origins, including laminarin, zymosan A, and *Euglena gracilis* β-glucan.[12] However, barley β-glucan possesses a linear structure composed of mixed β(1-3) and

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β(1-4) glycosidic linkages, which can distinctly govern its interaction capacity and binding mechanisms. Therefore, this study investigates the adsorption kinetics, binding capacity, FTIR spectral interactions, and functional antioxidant activity of the syringic acid–barley β-glucan complex under simulated physiological conditions (pH 7.0 and 37 °C). To the best of our knowledge, the interactions between syringic acid and barley β-glucan have not been previously investigated. This study aims to provide new insights into their adsorption behaviour.

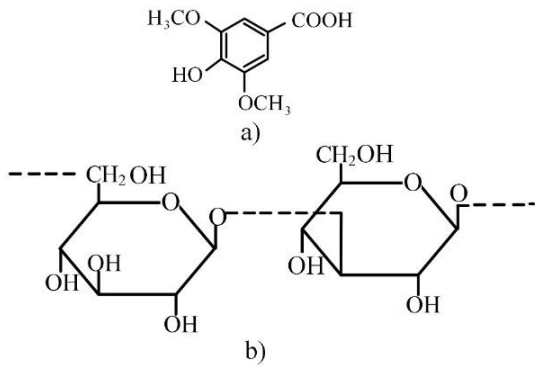


Fig. 1 – Chemical structure of (a) syringic acid and (b) barley β-glucan

Slika 1 – Kemijska struktura siringične kiseline (a) i β-glukana iz ječma (b)

2 Experimental

2.1 Chemicals

The following chemicals were used in this study: syringic acid (≥ 95 %) and barley β-glucan (≥ 95 %, G6513) for the adsorption experiments; sodium hydrogen phosphate dodecahydrate and sodium dihydrogen phosphate dihydrate for the preparation of phosphate buffer solution (0.1 M, pH 7.0); 2,2-diphenyl-1-picrylhydrazyl (DPPH˙) for the determination of antioxidant activity; and sodium carbonate and Folin–Ciocalteu reagent for total polyphenol determination. All chemicals were purchased from Sigma-Aldrich (St. Louis, MO, USA), except for the Folin–Ciocalteu reagent, which was obtained from Merck (Darmstadt, Germany).

2.2 Determination of syringic acid in the adsorption experiments

Syringic acid was determined using the Folin-Ciocalteu method for total polyphenol determination, based on the calibration curve of syringic acid.[12] After the adsorption experiment, 30 µl of syringic acid was added to a glass tube, followed by 2370 µl of distilled water, 150 µl of Folin-Ciocalteu reagent, and 450 µl of sodium carbonate (200 g l^{-1}). The solution was vortex-mixed and incubated in an incubator (Memmert, IN 30, Schwabach, Germany) for 30 min at 40 °C. The absorbance was measured at 765 nm using a spectrophotometer (Shimadzu, UV-1280, Kyoto, Japan).

2.3 Adsorption experiment

The adsorption of syringic acid onto barley β-glucan was investigated at 37 °C (body temperature) and pH 7.0 (representative of conditions in the gastrointestinal tract). Appropriate amounts of syringic acid and β-glucan (m_β) were weighed and placed in a plastic tube to a total volume of 10 ml (V_t) of buffer pH 7.0 resulting in the initial concentrations of 500 mg l^{-1} syringic acid (γ_i), and 500 mg l^{-1} β-glucan. The solutions were placed on a rotator (Grant-bio PTR-35, Oxon, England) and in an incubator (Memmert, IN 30, Schwabach, Germany) for 5 min, 10 min, 30 min, 1 h, 1.5 h, 2 h, 3 h, and 4 h. At each sampling time, the solutions were filtered using a vacuum filtration unit equipped with Whatman nylon membrane filters, 0.2 µm). The concentration of non-adsorbed syringic acid (γ_n) was determined using the Folin-Ciocalteu method. To evaluate the stability and potential degradation of syringic acid, syringic acid alone was monitored over time at pH 7.0 and 37 °C. No change in concentration was observed before or after incubation, and filtration confirmed the absence of adsorption to the vessel or membrane. Furthermore, phosphate buffer alone was passed through the membrane, and the resulting background absorbance in the Folin–Ciocalteu assay was subtracted from all measurements to correct for background absorbance. Because the retention of dissolved β-glucan or soluble syringic acid–β-glucan associations by the 0.2 µm membrane was not independently quantified, the calculated values should be interpreted as adsorption capacities obtained under the applied separation conditions. As an additional control, a β-glucan solution was subjected to the same filtration procedure, and the resulting filtrate showed no detectable response in the Folin–Ciocalteu assay.

The adsorption capacity q_t in mg of syringic acid adsorbed *per* g of β-glucan was calculated using Eq. (1) at each sampling time. All measurements were performed in duplicate, with each measured three times.

$$q_t = \frac{(\gamma_i - \gamma_n) \cdot V_t}{m_\beta} \quad (1)$$

2.4 Adsorption kinetic models: pseudo-first-order and pseudo-second-order

To better describe the adsorption process, the pseudo-first-order and pseudo-second order models were applied to the data obtained in the adsorption process (non-adsorbed

syringic acid concentration, y_n and adsorption capacity in time, q_t), using non-linear regression with the Solver tool in MS Excel (Microsoft Corporation, Redmond, USA). The parameters q_e and k_1 were obtained using Eq. (2), whereas q_e and k_2 were obtained using Eq. (3), where q_e represents the amount (mg) of syringic acid adsorbed per mass (g) of β-glucan at equilibrium, t is the reaction time (h), k_1 is the pseudo-first-order rate constant (h^{-1}), and k_2 is the pseudo-second-order rate constant ($g\,mg^{-1}\,h^{-1}$).

$$q_t = q_e\left[1 - e^{(-k_1 \cdot t)}\right] \quad (2)$$

$$q_t = \frac{q_e^2 \cdot k_2 \cdot t}{(q_e \cdot k_2 \cdot t) + 1} \quad (3)$$

2.5 Antioxidant activity

Antioxidant activity was determined for syringic acid and for a solution of syringic acid and β-glucan (syringic acid–β-glucan mixture) using the DPPH˙ method. The DPPH˙ radical was prepared at a concentration of 1 mmol l^{-1} in methanol. The absorbance of DPPH˙ blank solution was measured at 517 nm using a mixture of 300 µl DPPH˙ and 2700 µl methanol. Syringic acid solutions were prepared at concentrations of 100, 500, 700, and 1000 mg l^{-1} in 2700 µl of buffer and incubated at 37 °C for 4 h. To determine the antioxidant activity of the syringic acid–β-glucan mixture, syringic acid was prepared at concentrations of 100, 500, 700, and 1000 mg l^{-1} together with 500 mg l^{-1} β-glucan in 2700 µl of phosphate buffer and incubated at 37 °C for 4 h. Subsequently, 300 µl DPPH˙ was added to each sample, and the absorbance was measured after standing 7 min in the dark. The sample blank was prepared in the same manner as the samples, except that 300 µl of methanol was added instead of the DPPH˙ solution. The EC_{50} value was calculated from a plot of DPPH˙ inhibition (%) at steady state and mg of syringic acid in solution. The antioxidant reducing power (ARP) was also calculated ($1/EC_{50}$).

2.6 Analysis of syringic acid and ß-glucan interaction by FTIR spectroscopy

FTIR spectra were recorded for pure syringic acid and barley β-glucan in solid form, as well as for their complex. To obtain the syringic acid-β-glucan complex, syringic acid and β-glucan were allowed to interact by adsorption at pH 7.0 at 37 °C for 4 h, using concentrations of 500 mg l^{-1}. The solutions were vacuum-filtered, and the retained complex was dried. FTIR spectra were recorded for all samples in the range of 450–4000 cm^{-1} at a scanning resolution of 4 cm^{-1} using an FTIR spectrometer (PerkinElmer UATR, Massachusetts, U.S.).

2.7 Statistical analysis

All data analysis was performed in MS Excel (Redmond, USA) software. Root-mean-square error (RMSE) was calculated according to Eq. (4) where q_t is adsorption capacity in time, q_m is adsorption capacity obtained by the pseudo-first-order or pseudo-second-order model, and n is the number of data points.

$$\mathrm{RMSE} = \sqrt{\frac{\sum_i^n \left(q_{t,i} - q_{m,i}\right)^2}{n}} \quad (4)$$

Statistical evaluation was performed using one-way analysis of variance (ANOVA) followed by Tukey's post-hoc test in Statistica software (StatSoft Inc., Tulsa, OK, USA). Differences were considered statistically significant at $p < 0.05$. Data are presented as mean ± standard errors.

3 Results and discussion

3.1 Adsorption of syringic acid onto ß-glucan

The pH value was measured after the addition of the syringic acid and β-glucan to the prepared buffer and was 6.96. During the adsorption of syringic acid onto barley β-glucan, the adsorption capacity at different time points was calculated (Fig. 2). The syringic acid and β-glucan were not completely dissolved during the adsorption process. The adsorption capacity increased with time, indicating the binding of syringic acid to β-glucan. After 4 h, the adsorption capacity reached 339 mg g^{-1}. Previous studies have shown that polyphenols can interact with β-glucan.[13,14]

3.2 Adsorption kinetics of syringic acid onto ß-glucan

Adsorption kinetic studies are commonly used to gain a deeper understanding of the adsorption process. In this study, the adsorption kinetics are described using the pseudo-first-order and pseudo-second-order kinetic models,[15] which are widely applied to describe adsorption processes and estimate adsorption rate constants and capacities. Kinetic modelling provides insight into the

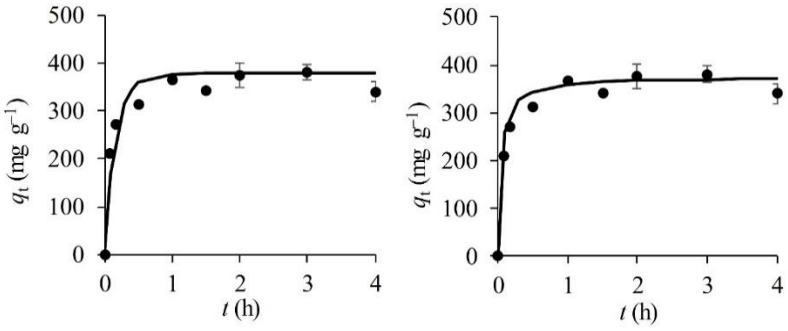


Fig. 2 – Adsorption capacity (q_t) of syringic acid and β-glucan, and fitted non-linear kinetic models of (a) pseudo-first-order and (b) pseudo-second-order for the adsorption of syringic acid onto β-glucan

Slika 2 – Adsorpcijski kapacitet siringične kiseline i β-glukana i modeli pseudo-prvog reda (a) i pseudo-drugog reda (b) dobiveni nelineranom regresijom za adsorpciju siringične kiseline na β-glukanu

adsorption process and can help to characterise the overall adsorption mechanism. In this study, pseudo-first-order and pseudo-second-order models were applied to the experimental data obtained for the adsorption of syringic acid onto β-glucan (Fig. 3). Both kinetic models showed good agreement with the experimental data (Fig. 2). Kinetic parameters like adsorption capacity q_e, rate constants k_1 and k_2 were obtained by non-linear regression, and are presented in Table 1. Although differences in the goodness-of-fit parameters were observed between the two models, kinetic model fitting alone is insufficient to establish a specific adsorption mechanism. Therefore, the models were used primarily to characterise the time-dependent adsorption behaviour under the investigated experimental conditions. Reaction half-time for the pseudo-second-order model was 0.045 h and for the pseudo-first-order model it was 0.12 h (Table 1). No statistically significant differences were observed in the adsorption capacities and reaction half-times between the pseudo-first-order and the pseudo-second-order kinetic models (Table 1).

3.3. Antioxidant activity

Antioxidant activity, expressed as the EC_{50} value and antiradical power (ARP), is presented in Table 2. Both syringic acid and the syringic acid–β-glucan mixture showed antioxidant activity. Accordingly, the syringic acid–β-glucan mixture exhibited a slightly higher EC_{50} value and lower ARP, suggesting reduced radical-scavenging capacity; however, the difference was not statistically significant. This reduction may be associated with interactions between syringic acid and β-glucan, which could reduce the availability of phenolic groups involved in radical scavenging. Since the antioxidant activity of phenolic acids is mainly related to their ability to donate hydrogen atoms or electrons, any interaction affecting these active groups may decrease the overall antioxidant potential of the syringic acid–β-glucan mixture. Further research is needed to elucidate how the interaction between syringic acid and β-glucan affects the antioxidant activity of syringic acid and the resulting complex. Previous studies have demonstrated the antioxidant activity of syringic acid at pH 7.4.[16] To better understanding its antioxidant behaviour, further research incorporating complementary assays, such as ABTS, FRAP, or ORAC, is needed to evaluate the antioxidant activity of the syringic acid–β-glucan complex across different reaction mechanisms.

3.4. Interaction monitored by FTIR spectra

The FTIR spectra were recorded for syringic acid and barley β-glucan solids, as well as for their complex (Fig. 3). All peaks in the FTIR spectra are presented in the range from 800 to 1800 cm^{-1}. In the FTIR spectrum of syringic acid, peaks were observed at 1697 cm^{-1} (C=O), 1615 and 1520 cm^{-1} (OH, CH, C−OH), 1456, 1417, and 1370 cm^{-1} (OH and methoxy groups), 1176, 1103, and 1040 cm^{-1} (CH), and 937 cm^{-1} (C−COOH). The identified peaks are in agreement with those reported in the literature.[17] Barley β-glucan exhibited FTIR peaks at 1319 and 1418 cm^{-1}, corresponding to OH bending, and at 1068 and 1153 cm^{-1}, associated with the linear β-glucan structure through β(1-3) linkages. A peak at 900 cm^{-1} was also observed, corresponding to β(1-4) linkages. The identified peaks are in agreement with those reported in the literature.[18] In the syringic acid–β-glucan complex, peaks originating from both syringic acid (1370 and 1176 cm^{-1}) and β-glucan (1153, 1068, and 900 cm^{-1}) were observed, indicating the presence of both components in the complex.

Table 1 – Adsorption kinetic parameters for the pseudo-first-order and pseudo-second order models
Tablica 1 – Adsorpcijski kinetički parametri pseudo-prvog i pseudo-drugog reda

Pseudo-first-order Pseudo-prvi red			$t_{1/2}$/h
q_e/mg g^{-1}	k_1/h^{-1}	RMSE	0.12 ± 0.011[a]
378 ± 13[a]	5.89 ± 0.21	33	
Pseudo-second-order Pseudo-drugi red			$t_{1/2}$/h
q_e/mg g^{-1}	k_2/g mg^{-1} h^{-1}	RMSE	0.045 ± 0.0013[a]
375 ± 7[a]	0.059 ± 0.002	22	

Different lower-case letters correspond to differences between q_e and $t_{1/2}$ values obtained using the post-hoc Tukey test at $p < 0.05$

The peaks at 1615, 1520, 1456, 1417, and 1370 cm^{-1} exhibited lower intensity suggesting a probable interaction between the components, which may indicate non-covalent interactions, including possible hydrogen bonding. In addition, the peak at 937 cm^{-1} exhibited lower intensity, providing further evidence of hydrogen-bond formation as a probable mechanism for the adsorption of syringic acid onto β-glucan. While these spectral variations suggest probable non-covalent interactions, further complementary characterisation techniques would be required to definitively confirm the complexation mechanism. Confirmation of a specific interaction mechanism would require additional analyses, such as normalised or difference spectra, comparison with a physical mixture, or complementary techniques such as DSC, NMR, or ITC.

3.5. ß-Glucan and syringic acid interactions

Adsorption techniques are widely used to investigate interactions between polyphenols and dietary fibres because they enable the evaluation of adsorption capacity and the effects of factors such as pH, temperature, ionic strength, and the chemical structures of polyphenol and dietary fibre.[19] In the present study, under the investigated experimental and separation conditions, syringic acid adsorbed onto β-glucan at pH 7.0 and 37 °C, with an adsorption capacity of 339 mg g^{-1}. Previous studies have reported adsorption capacities of phenolic acids onto β-glucan in the range of 48–438 mg g^{-1}.[20] Several factors can influence the adsorption behaviour of syringic acid and β-glucan, including their chemical structures. The chemical structure of syringic acid (Fig. 1) may contribute to its biological activity.[3] Barley β-glucan is a soluble polysaccharide composed of glucose units.[7] Polyphenols can bind to dietary fibres through non-covalent interactions, including hydrogen bonding and hydrophobic interactions.[21]

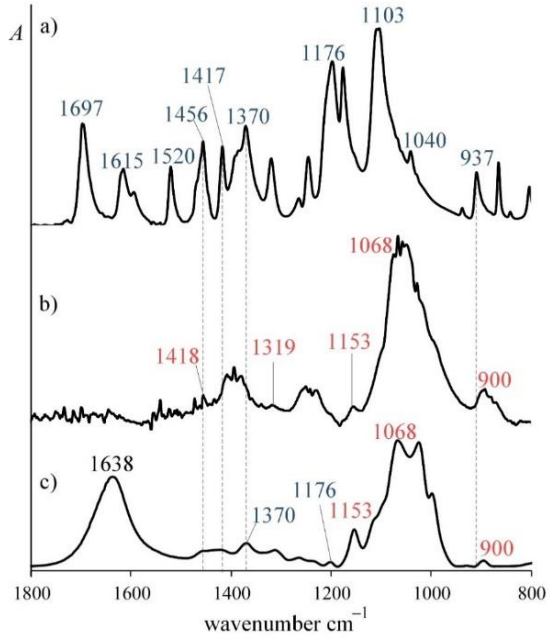


Fig. 3 – FTIR spectra of (a) syringic acid, (b) barley β-glucan and (c) syringic acid – β-glucan complex

Slika 3 – FTIR spektar siringične kiseline (a), β-glukana iz ječma (b) i kompleksa siringična kiselina – β-glukan

At pH 7.0, syringic acid is deprotonated due to its pKa value.[22] Adsorption kinetics can provide further insight into the interactions between syringic acid and β-glucan. In the present study, both the pseudo-first-order and pseudo-second-order kinetic models showed good agreement with the experimental data. Similar kinetic models have previously been applied to describe the adsorption of phenolic acids onto β-glucan.[23] One potentially beneficial property of syringic acid for human health is its antioxidant capacity. Syringic acid has been reported to exhibit free-radical-

Table2 – EC_{50} value and ARP for syringic acid and the syringic acid–β-glucan mixture
Tablica 2 – EC_{50} i ARP vrijednosti za siringičnu kiselinu i smjesu siringična kiselina–β-glukan

Solution Otopina	EC_{50} mg of syringic acid	ARP
syringic acid siringična kiselina	0.51 ± 0.02^a	1.96 ± 0.08^a
syringic acid–β-glucan mixture smjesa siringična kiselina–β-glukan	0.53 ± 0.01^a	1.88 ± 0.05^a

Different lower-case letters correspond to differences between EC_{50} and ARP values obtained using the post-hoc Tukey test at $p < 0.05$

scavenging activity against DPPH˙ radicals.[3] Monitoring antioxidant activity during the adsorption process is essential for understanding how interactions between polyphenols and β-glucan may influence the antioxidant properties of polyphenols. Previous studies have shown that polyphenols released from dietary fibre in gastrointestinal tract can retain high radical-scavenging activity.[24]

The interaction between dietary fibres and polyphenols is important for the development of functional foods[10] and colon-targeted delivery systems. Polyphenols can bind to dietary fibres, which may reduce their release and absorption in the upper gastrointestinal tract. Consequently, a larger fraction of polyphenols may reach the colon, where they can be released during microbial fermentation of the fibre matrix and subsequently transformed into smaller phenolic metabolites. This is particularly relevant because these metabolites may contribute to antioxidant, anti-inflammatory, and prebiotic effects in the colon. Several studies have suggested that dietary fibres may act not only as carriers of polyphenols but also as modulators of their stability, bioaccessibility, and biological activity. Moreover, the combined presence of fibres and polyphenols may have a synergistic effect on gut microbiota composition and metabolite production, supporting their potential application in colon-targeted delivery systems and functional food formulations.[25,26] Syringic acid and barley β-glucan may therefore have potential for use in functional food formulations. The interaction between syringic acid and β-glucan may contribute to the protection of syringic acid during digestion.

However, further studies are needed to elucidate the mechanisms of their interaction, their stability under gastrointestinal conditions, and their potential biological effects.

Future research should focus on *in vitro* and *in vivo* digestion studies, the influence of gut microbiota on the release and metabolism of bound polyphenols, and the evaluation of bioavailability and bioactivity following gastrointestinal digestion.

4 Conclusion

The results of this study show that syringic acid interacted with β-glucan through an adsorption process under the investigated experimental conditions (pH 7.0 and 37 °C, and specific initial concentrations). The adsorption kinetics were described using pseudo-first-order and pseudo-second-order kinetic models, with the obtained rate constants suggesting that the interaction occurred over time. The adsorption of syringic acid onto β-glucan may influence the functional behaviour of syringic acid, particularly its antioxidant activity at the tested pH value. FTIR analysis confirmed the presence of spectral features attributable to both components and suggested possible non-covalent interactions between syringic acid and β-glucan. These findings provide physicochemical insight into the interaction between syringic acid and barley β-glucan, and provide a basis for further studies under gastrointestinal conditions. However, stability, release behaviour, and bioaccessibility were not directly evaluated in this study. Therefore, any proposed benefits regarding improved bioavailability or therapeutic potential remain theoretical. Further research, including simulated gastrointestinal digestion experiments, release-kinetics studies, and biological assays, is required to evaluate the functional stability and actual performance of this complex in physiological systems. Since adsorption is strongly influenced by environmental factors, the conclusions of this study apply strictly to the selected experimental conditions. Further research should investigate the effects of different pH values and ionic strengths, as well as simulated physiological conditions, to provide a more comprehensive understanding of the interaction mechanisms and behaviour of the syringic acid–β-glucan complex during digestion.

ACKNOWLEDGEMENT

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List of symbols and abbreviations
Popis kratica i simbola

DPPH$^{\cdot}$ – 2,2-diphenyl-1-picrylhydrazyl
– 2,2-difenil-1-pikrilhidrazil

m_β – β-glucan mass
– masa β-glukana

V_t – total volume of solution
– ukupan volumen otopine

y_i – initial mass concentration of syringic acid
– početna koncentracija siringične kiseline

q_t – adsorption capacity of syringic acid onto β-glucan in time
– adsorpcijski kapacitet siringične kiseline na β-glukan

q_e – adsorption capacity of syringic acid onto β-glucan at equilibrium
– adsorpcijski kapacitet siringične kiseline na β-glukan u ravnoteži

y_n – mass concentration of non-adsorbed syringic acid
– neadsorbirana masena koncentracija siringične kiseline

k_1 – pseudo-first-order rate constant
– konstanta brzine reakcije pseudo-prvog reda

k_2 – pseudo-second-order rate constant
– konstanta brzine reakcije pseudo-drugog reda

RMSE – root-mean-square error
– korijen srednje kvadratne pogreške

ARP – antiradical power
– antiradikalna moć

EC_{50} – concentration required to achieve 50 % radical scavenging activity
– koncentracija potrebna za postizanje 50 %-tne aktivnosti hvatanja slobodnih radikala

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SAŽETAK

Adsorpcija siringične kiseline na ß–glukan: kinetika adsorpcije, antioksidacijska aktivnost i FTIR analiza

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Siringična kiselina pripada skupini polifenola i poznata je po svojim biološkim svojstvima uključujući antioksidacijsku aktivnost. β-glukani su prehrambena vlakna s potencijalnom funkcionalnom i biomedicinskom primjenom, a njihove interakcije s polifenolima mogu utjecati na stabilnost, dostupnost i biološku aktivnost polifenola. Proučavanje interakcije između siringične kiseline i β-glukana može pružiti uvid u njihovo ponašanje. Cilj ovog rada bio je ispitati interakcije između siringične kiseline i β-glukana tijekom procesa adsorpcije kroz vrijeme pri pH 7,0 i temperaturi od 37 °C. Primijenjeni su kinetički modeli pseudo-prvog i pseudo-drugog reda te je određeno vrijeme polureakcije. Nisu utvrđene statistički značajne razlike između vrijednosti EC_{50} i ARP za siringičnu kiselinu i smjesu siringične kiseline i β-glukana. FTIR spektri snimljeni su za siringičnu kiselinu, β-glukan i kompleks siringična kiselina–β-glukan. Rezultati su pokazali da se siringična kiselina adsorbira na β-glukan s adsorpcijskim kapacitetom od 339 $mg\,g^{-1}$. Konstante brzine reakcije iznosile su 5,89 h^{-1} za model pseudo-prvog reda i 0,059 $g\,mg^{-1}\,h^{-1}$ za model pseudo-drugog reda. Antioksidacijska aktivnost reakcijske otopine bila je manja od siringične kiseline. FTIR spektri potvrdili su adsorpciju siringične kiseline na β-glukan te ukazali na moguće interakcije između funkcionalnih skupina.

Ključne riječi

Siringična kiselina, β-glukan, adsorpcija, adsorpcijska kinetika, antioksidacijska aktivnost

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