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BIOLOGICALLY-DERIVED CORN STARCH AND GLYCEROL COATINGS FOR POSSIBLE WOOD SURFACE MODIFICATION: ANALYSIS OF STRENGTH AND MOISTURE-RELATED PROPERTIES

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Abstract. The current study analyses the possible application of corn starch- and glycerol-based coatings on wood surfaces to assess their impact, both positive and negative, and the necessity to modify them to improve strength and moisture-related properties. It was determined that glycerol content up to 100 wt.% in corn starch coatings results in reduced tensile strength from 2.7 MPa to 1.2 MPa and modulus of elasticity from 28 MPa to 6.3 MPa, while elongation at break remains unchanged up to 75 wt.% glycerol. In addition, it is shown that the highest content of glycerol increased moisture content by a maximum of 266% in coatings compositions, while the carried study revealed the systematic impact of glycerol's tendency to form water-soluble coatings on water absorption values, which have been reduced to 60% when water solubility increased to 47%. The results from mechanical and moisture-related properties allowed us to conclude that biologically derived coatings are necessary for possible wood surface treatment modified with hydrophobicity-inducing oils.

Keywords: biologically-derived coatings, corn starch, glycerol, wood modification, biocomposite systems, moisture-related properties, tensile properties.

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1. Introduction

Recently, the use of biopolymer materials has rapidly expanded due to the growing need for environmentally friendly, renewable solutions. One of the main areas of research is the development of biologically-derived biopolymer coatings that can act as a protective barrier and regulate moisture release in various composite systems. Such coatings are widely used in food packaging technologies to reduce water vapour diffusion and extend product shelf life (Avramescu et al., 2020).

Lignocellulosic materials, including wood and wood wool, are characterised by pronounced hygroscopic properties. Their porous structure and high concentration of hydroxyl groups allow them to easily absorb and release moisture from the environment. This phenomenon can significantly affect the stability of composites, especially when wood filler is incorporated into moisture-sensitive polymer matrices. The literature indicates that cellulose substrates themselves have limited barrier properties to water vapour; therefore, their surface modification with biopolymer layers is recognised as an effective method for increasing moisture resistance (Rozas et al., 2025).

Starch occupies a central position among the most studied biopolymers used for film and coating applications. Starch, a natural polysaccharide, is a widely available agricultural raw material and is characterised by its biodegradability, low cost, and excellent film-forming properties (Gonçalves et al., 2024). Due to these properties, starch-based coatings are considered a promising alternative to synthetic packaging materials (Leiva et al., 2022). The structure of starch consists of two main macromolecules: amylose and amylopectin. The ratio of these components determines the material's physical and mechanical properties, including the gelatinisation temperature, film strength, and water-absorption capacity (Azeem, 2025). Despite its many advantages, the widespread use of natural starch is limited by its pronounced hydrophilicity. Films made from raw starch have relatively high vapour permeability and limited mechanical stability at high humidity (Oyekunle et al., 2024). Therefore, a large part of modern research is devoted to modifying the starch structure by introducing various additives or by developing composite systems. Such modifications not only improve the mechanical properties and increase the material's stability, but also significantly reduce the diffusion of water vapour through the film (Mojo-Quisani et al., 2024).

Plasticisers are among the most popular components of starch-based coatings. Their role is to weaken the intermolecular interactions between polymer chains, which gives the material the necessary flexibility. Glycerol is recognised as one of the most common plasticisers for starch-based films and coatings (Shah et al., 2023). Studies show that the use of glycerol allows the formation of a homogeneous, elastic and less brittle layer (Eddin & Tahergorabi, 2019).

The ability of starch coatings to regulate moisture release is supported by extensive experimental data. For example, studies on stone fruits (plums) showed that using a starch film reduced weight loss by almost half compared with untreated samples (Basiak et al., 2022). This indicates that starch-based coatings can effectively stabilise the moisture balance of materials. Similar results were obtained with starch formulations for egg processing: these coatings significantly reduced moisture loss and extended the product's shelf life (Eddin & Tahergorabi, 2019).

The effectiveness of starch films can be further optimised by combining them with other biopolymers. For example, starch/wheat gluten composites have been shown to improve mechanical properties and reduce moisture loss in coated products (Leiva et al., 2022). In addition, starch/chitosan complexes have been shown not only to improve the material's barrier properties but also to inhibit microbial growth (Oyekunle et al., 2024). This combination allows for the integration of the advantages of various biopolymers to create a more stable structure.

Modern research in biopolymer coatings also includes the development of starch-based composites incorporating various bioactive components. For example, composite films containing onion peel powder have demonstrated improved mechanical properties and antibacterial activity (Torche et al., 2025). These results confirm that the properties of biopolymer layers can be effectively controlled by varying their composition and the types of additives used. In addition to polysaccharide systems, other biopolymers, such as proteins or commercial bioplastics, are also discussed in the literature. Protein-based packaging materials have good mechanical properties, but their moisture resistance often remains limited (Shah et al., 2023).

Although the literature does not indicate any water-resistant starch-based coatings, other improved functional properties of wood substrates have been reported. For instance, Tretsiakova-McNally et al. (2021) demonstrated the successful development of environmentally benign starch-based formulations, with and without inorganic salts, for passive fire protection of wood substrates. The results showed that it is possible to achieve a notable delay in ignition and a reduction in heat release parameters compared to the untreated wood surface. In addition, Jiang et al. (2019) showed that starch can be used as an effective adhesive for wood-to-wood surface adhesion. However, the authors chose to modify starch with isocyanates, which are known as carcinogens. Further investigations by Chan et al. (2024) of starch-based coatings concluded that some essential oils, such as lemongrass, can positively influence the strength characteristics of the resulting coatings. Authors showed that even 0.2 wt.% lemongrass essential oil increased the strength by almost 55% while moisture-related properties deteriorated. In conclusion, starch-based coatings are a promising class of biopolymer materials that can effectively alter the properties of wood-based materials due to their excellent formability and biodegradability, but their hydrophilic nature needs further modification. Therefore, a protective coating based on starch and glycerol is chosen for testing to gain insight into its potential application as a coating material for wood-based aggregate modification, as the suggested approach has not been analysed in the literature.

2. Materials and methods

For the synthesis of biologically-derived coatings, glycerol, corn starch, and potassium hydroxide were chosen. Corn starch (JSC Eurohorecana, Vilnius, Lithuania) was selected as the base raw material for the coatings. Glycerol and potassium hydroxide, supplied by JSC Lerochem, Klaipėda, Lithuania, were incorporated, respectively, to impart a plasticising effect and disrupt the hydrogen bonds that hold starch granules together.

The compositions used to prepare biologically-derived coatings are presented in Table 1, and the preparation scheme is shown in Figure 1.

The required amount of 20 °C water was measured and mixed with a selected amount of corn starch following the addition of potassium hydroxide. The prepared premix was then heated to (80±5) °C and stirred at 800 rpm using a magnetic stirrer for 10 minutes. In order to prevent phase separation, the coating premix is cooled down to (60±5) °C to incorporate the required amount of plasticizer. After that, the prepared mixture is mixed for 5 minutes and poured into 90 mm diameter Petri dishes (35 g per dish). Hardening of the biologically-derived coatings was implemented in the air atmosphere at (23±5) °C temperature and (50±5)% relative air humidity for 7 days.

The prepared biologically-derived coatings were further tested for thickness, tensile strength, and moisture-related characteristics. The impact of glycerol content on the thickness of all coatings was measured using a digital caliper (CD-30PPX, Mitutoyo, Japan) with an accuracy of 0.001 mm. Three specimens for each composition were tested.

Table 1. Compositions of biologically-derived coatings

Raw material	Amount
Corn starch, g	4
Water, g	100
Potassium hydroxide, g	0.04
Glycerol, g	0; 1; 2; 3; 4
Glycerol, wt.% (based on corn starch)	0; 25; 50; 75; 100

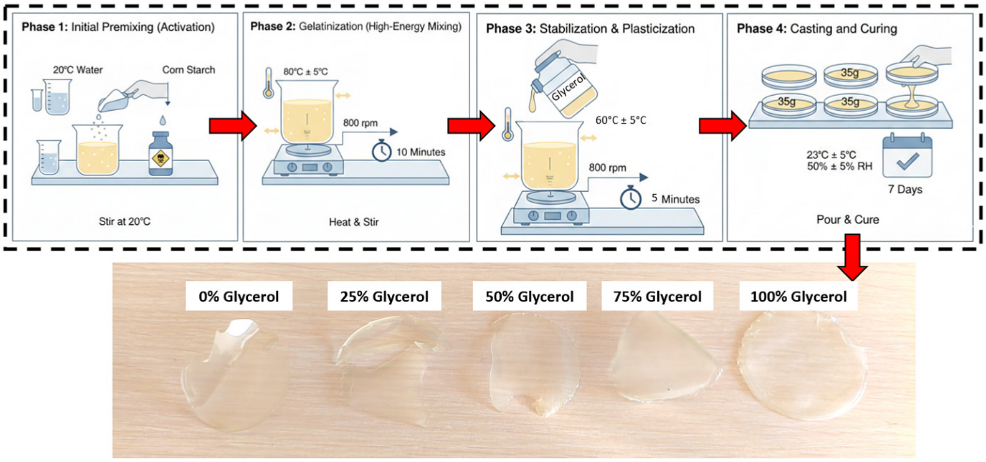

Figure 1. Preparation scheme of biologically-derived coatings

Tensile strength, modulus of elasticity and elongation at break were determined according to the requirements of ASTM D882-12 with universal testing machine Hounsfield H10KS (Hounsfield, Surrey, UK) with a maximum loading force of 10 kN, a loading accuracy of ±0.5% and a loading speed accuracy of ±0.05%. Three specimens for each composition were tested.

The moisture content of the biologically-derived coatings was calculated using the method outlined by Biratu et al. (2024). Coatings having an initial weight (W_1) were dried at 105 °C in a ventilated oven until a constant weight (W_2) was achieved, with weighing every 24 hours. Before the test, all coatings were conditioned at (23±5) °C temperature and (50±5)% air humidity conditions for 24 hours. The moisture content (MC) was then calculated as % according to Eq. (1).

$$MC = \frac{W_1 - W_2}{W_1} \cdot 100. \qquad (1)$$

Water absorption was determined according to ISO 62, with some minor modifications. All coatings were dried in a ventilated oven at 70 °C for 24 hours and weighed (W_0). The dried samples were then soaked in water at 25 °C for 30 min., 60 min., 120 min., 240 min., and 1440 min. The samples were kept in the same water through the whole procedure. After the soaking procedure, the excess water was removed from the coatings' surface and then weighed (W_1). Further, the coatings were dried in a ventilated oven at 70 °C for 24 hours and weighed (W_2). Water absorption (W_p) results, expressed as %, were calculated using Eq. (2).

$$W_p = \frac{W_1 - W_0}{W_0} \cdot 100. \qquad (2)$$

Water solubility (W_S) was calculated according to Eq. (3).

$$W_S = \frac{W_0 - W_2}{W_0} \cdot 100. \qquad (3)$$

All graphs related to water absorption and water solubility based on soaking time display grouped results for all compositions of biologically derived coatings. Higher upper and lower limits for the results' scattering were presented to improve interpretation and avoid overlapping results.

Experimental analysis was conducted using mathematical and statistical methods, during which dispersions were evaluated, and distribution functions and parameters were determined using Statistica (8.0). To determine the optimal relationship among X, Y, and Z, a non-linear correlation method was used. According to the obtained determination coefficient, it was possible to conclude a relationship between the three parameters.

3. Results and discussion

3.1. Thickness of the biologically-derived coatings

Table 2 shows that biologically-derived coatings with increasing glycerol content (0–100 wt.%) have thicknesses ranging from 0.47 mm to 1.04 mm. The values indicate that adding glycerol as a plasticizer increases the thickness of the final coatings. Interestingly, Lintang et al. (2021) concluded that starch-based coatings decreased in thickness when up to 1.75 wt.% glycerol was added, whereas further additions increased the coating thickness, as shown in Table 2.

Table 2. Thickness measurement results for biologically-derived coatings

Parameter	Glycerol amount, wt.%				
	0	25	50	75	100
Thickness, mm	0.47±0.08	0.82±0.13	0.86±0.10	0.97±0.15	1.04±0.13

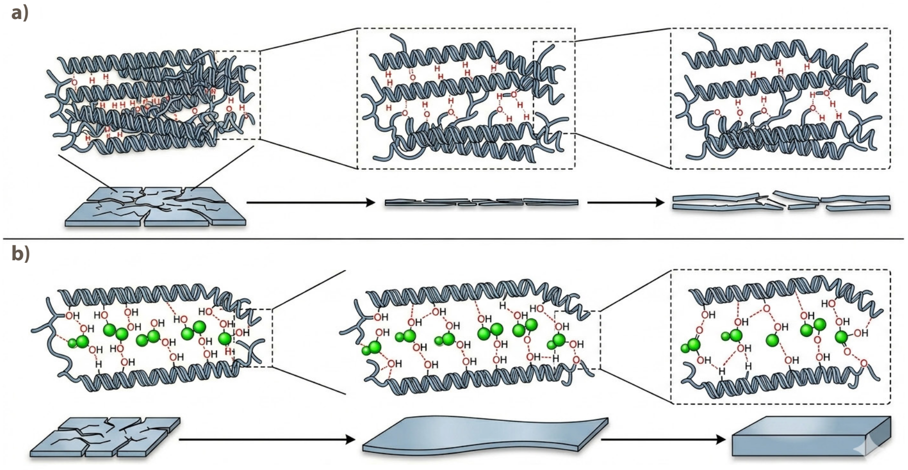

Figure 2. Simplistic schematic representation of the formation of biologically-derived coatings: a) before; b) after the addition of glycerol

The increase in thickness observed is due to glycerol's ability to penetrate the starch network. Figure 2 shows a schematic representation of the state and formation of coatings before (Figure 2a) and after (Figure 2b) the addition of glycerol.

Yang et al. (2024) and Teobaldi et al. (2025) reported that starch consists of long, tightly packed amylose and amylopectin chains. These chains bind through hydrogen bonding, forming thin, brittle coatings. However, the incorporation of the glycerol plasticizer allows it to wedge itself between the long, tightly packed starch chains due to its high polarity and three hydroxyl groups. This way, the resulting products are flexible and can be used as coating materials for various purposes.

3.2. Mechanical performance of the biologically-derived coatings

Generally, the tensile properties of prepared biologically-derived coatings, such as tensile strength, modulus of elasticity, and elongation at break, are the parameters measured to assess the coatings' resistance to protecting the coated products or aggregates from mechanical damage (Lin & Chen, 2024). Therefore, the main tensile properties are presented in Table 3, while the graphs representing coatings' behavior during tension are shown in Figure 3.

As mentioned before, the amylose and amylopectin molecules in starch form a dense network (Figure 2a), resulting in brittle coatings. Therefore, Table 3 shows that the tensile properties of coatings without glycerol were not determined. However, the addition of glycerol from 25 wt.% to 100 wt.% showed a significant effect, i.e., the tensile strength reduced almost twice, the modulus of elasticity – more than 4 times, and the elongation at break – more than 1.5 times.

The reduction in the tensile strength and modulus of elasticity can be explained by the scientific justification indicated in Esmaeili et al. (2017) that glycerol molecules intervene between starch chains, thus replacing stronger starch-starch bonds with slightly weaker starch-glycerol

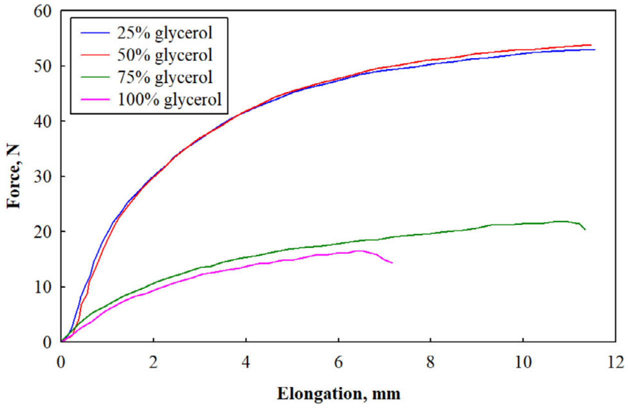

Figure 3. Tensile strength evolution for the biologically-derived coatings

Table 3. Tensile parameters of the biologically-derived coatings

Parameter	Glycerol amount, wt.%				
	0	25	50	75	100
Tensile strength, MPa	–	2.73±0.3	2.63±0.3	1.32±0.1	1.22±0.2
Modulus of elasticity, MPa	–	28.2±2.4	27.2±2.2	8.50±1.1	6.34±0.92
Elongation at break, mm	–	11.6±1.5	11.5±1.4	11.3±1.1	7.2±0.65

bonds. Furthermore, it is worth noting that glycerol, as a plasticizer in coating compositions, increases the free volume between starch polymer chains, reducing internal friction and making it easier for chains to slide past each other even with little tensile force applied.

Based on Akachat et al. (2025), elongation at break and flexibility of glycerol-plasticized coatings increase with the addition of plasticizer up to 30 wt.%, whereas the current study indicates that elongation at break remains the same up to 75 wt.%. % glycerol (Table 3 and Figure 3 – blue, red and green lines). However, further incorporation of glycerol to 100 wt.% reduce the parameter by almost 38% compared to coatings with 25 wt.% glycerol (Figure 3 – pink line). Such a result indicates over-plasticization, leading to loss of cohesion (Chen et al., 2024). This indicates that the glycerol concentration is too high, and the starch network loses structural integrity due to insufficient starch-starch contact points.

3.3. Water resistance parameters of the biologically-derived coatings

Coatings made of hydrophilic proteins and polysaccharides generally have low water resistance (Ahammed et al., 2020); therefore, it is of great importance to analyze the impact of added glycerol on MC, water absorption and water solubility. Table 4 shows that the MC of all compositions increases with increasing glycerol content.

It was previously determined by Basiak et al. (2018) that the amount of plasticizer, in this case glycerol, led to a higher monolayer MC due to glycerol's hygroscopicity, resulting in a 266% higher MC for films with 100 wt.% glycerol compared to the ones with no glycerol. Accordingly, the corresponding changes in water absorption and water solubility are also evident in Figure 4. Kibar and Us (2013) showed that plasticizers are generally more hygroscopic than starch. In fact, Muscat et al. (2012) revealed that the amount of water absorbed by starch films increases with increasing xylitol and glycerol content.

The results presented in Figures 4a and 4b are somewhat controversial because they show that glycerol reduces water absorption over time. Dispersion analysis (Figure 4 and Table 5) shows that both water absorption and water solubility depend primarily on the glycerol content. The water absorption kinetics study (Figure 4a) shows that water absorption starts to increase from 30 min. to 60 min. After 30 min., the parameter of the biologically-derived coatings reaches ~91%, and after 60 min., it increases to ~95%. In addition, it remains stable up to 120 min. However, from 120 min. to 1440 min, a decrease in water absorption to about 88% is observed. Figure 4b shows that water absorption depends on the glycerol content: coatings without glycerol reach ~130% water absorption, whereas coatings with 100 wt.% glycerol reach ~60%.

Table 4. Water resistance parameters of the biologically-derived coatings

Parameter	Glycerol amount, wt.%				
	0	25	50	75	100
MC, %	11.4±0.25	12.5±0.13	23.9±0.36	33.9±0.28	41.8±0.42

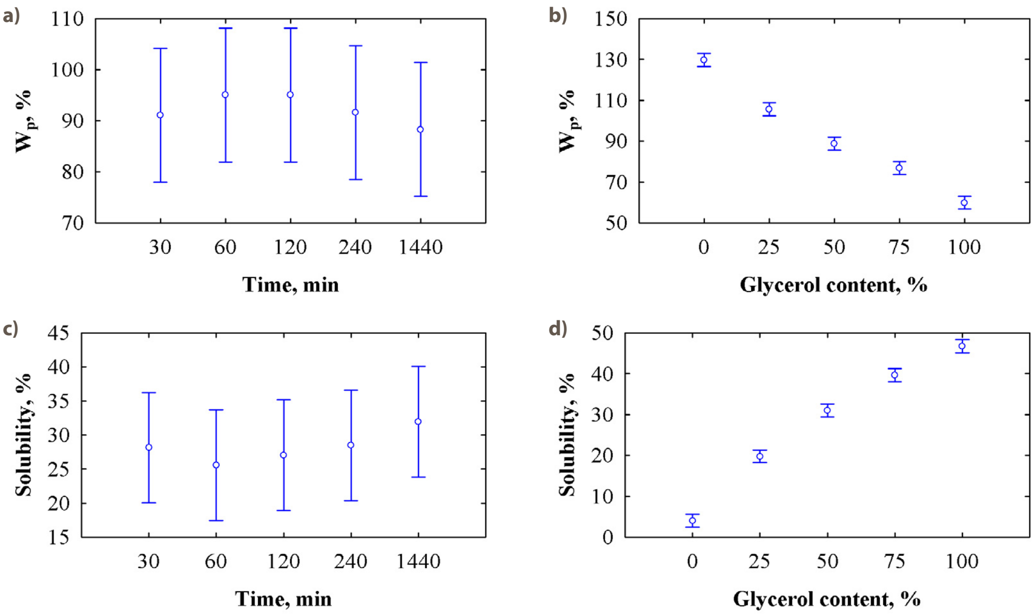

Figure 4. Moisture-related properties of biologically-derived coatings: a) time impact on water absorption; b) glycerol content impact on water absorption; c) time impact on water solubility; d) glycerol content impact on water solubility

Table 5. Statistical processing results of water absorption and water solubility of biologically-derived coatings

Fig. No.	Samples	R	R^2	R^2 corrected	S_r	F	p
Water absorption within time							
4a	75*	0.104	0.0109	–0.0456	24.9	0.192	0.94
Water absorption based on glycerol content							
4b	75*	0.971	0.943	0.939	6.31	287.4	0
Water solubility within time							
4c	75*	0.138	0.0190	–0.0370	15.5	0.340	0.85
Water solubility based on glycerol content							
4d	75*	0.981	0.963	0.960	3.07	449.5	0

Notes: * three specimens in each sample for each glycerol content.

Water solubility analysis (Figure 4c and Table 5) shows that water solubility decreases from ~28% to ~26% between 30 min. and 60 min. When the samples are kept in water for a longer period, i.e. from 60 min. to 1440 min., the solubility of the coatings increases. In this case, the water solubility values vary from ~26% to ~32%. It is also found that water solubility depends on the glycerol content; i.e., biologically-derived coatings with no glycerol reach ~4% water solubility, while those with 100 wt.% Glycerol has water solubility up to 47%. The results show that glycerol significantly affects the water absorption and water solubility of the biologically-derived coatings.

However, if the results of water absorption and water solubility are analyzed systematically, it would be obvious that the reduction in water absorption with the addition of glycerol can be explained by the fact that part of the coatings dissolve in water (Figure 4c and Figure 4d), thus resulting in lower water absorption values (Figure 4a and Figure 4b). Therefore, it might be concluded that the apparent reduction in water absorption for coatings with a higher content of glycerol is not a result of the improved water resistance, but rather a consequence of higher water solubility. Even though it is uncommon and was not previously considered by other authors who studied such coatings, further studies on changes in pH and electrical conductivity of water during the solubility test might be beneficial for explaining the exact role of varying amounts of glycerol.

Next, the water absorption and water solubility of the biologically-derived coatings are evaluated, taking into account the time in water and the glycerol content. Figures 5a and 5b show the dependence of water absorption on time and glycerol content.

The presented dependences can be described by the following equations:

$$W_p = 130.0428 - 0.00372 \cdot t - 0.8911 \cdot m_G + 0.002178 \cdot m_G^2 \tag{4}$$

with $R^2 = 0.944$, $R = 0.972$ and $S_r = 6.01\%$;

$$W_S = 3.001791 + 0.003569 \cdot t + 0.64884 \cdot m_G - 0.00228 \cdot m_G^2 \tag{5}$$

with $R^2 = 0.977$, $R = 0.989$ and $S_r = 2.39\%$,

where: W_p – water absorption by total immersion, %; W_S – water solubility, %; t – time, s; m_G – glycerol content, wt. %.

To evaluate all the results obtained from the study, Table 6 presents a summary and comparison with other authors' work. As shown by other authors' results, the numerical values of each parameter can vary over broader ranges due to starch type, as different starches have varying amylose and amylopectin contents. For instance, rice starch from Aghazadeh et al. (2018) study had only 15% amylose, while other studied starches from 23% to 25%. Therefore, it is not a surprise that rice starch-based coatings had lower mechanical performance.

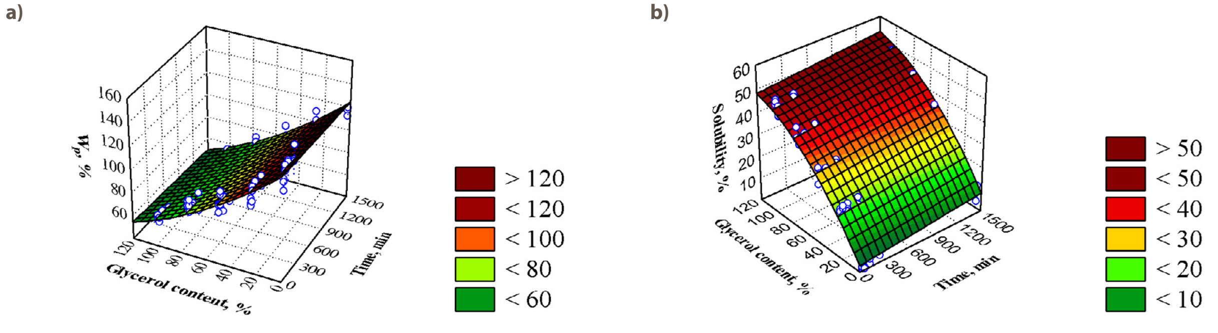

Figure 5. Time in water and glycerol content impact on: a) water absorption; b) water solubility

Table 6. Summary of the results of the current study and their comparison with other authors works

Starch type	Glycerol, %	Parameter						Ref.
		Thickness, mm	Tensile strength, MPa	Modulus of elasticity, MPa	Elongation at break, %	Water absorption, %	Water solubility, %	
Rice	33	0.47	1.34	–	53.8	203	–	Wang et al. (2025)
Wheat	33–50	0.064–0.081	3.29–2.10	–	15.2–18.1	–	30.2–34.8	Basiak et al. (2018)
Potato	10–40	–	17–2.0	–	16–4	–	19.3–27.4	Fu et al. (2021)
Corn	1.6–1.8	0.19–0.21	3.8–2.5	22–5	61–60	–	–	Aghazadeh et al. (2018)
Wheat	1.6–1.8	0.19	5.0–1.9	10–7	40–39	–	–	
Rice	1.6–1.8	0.19	2.1–1.5	2.5–2.0	75–100	–	–	
Corn	25–100	0.82–1.04	2.73–1.22	28.2–6.34	60–3.0	109–60	4-47	Current study

The Wang et al. (2025) study showed even lower results, e.g., tensile strength, at higher thicknesses of rice starch-based coatings. Comparing the obtained mechanical properties results with the ones from Aghazadeh et al. (2018) study, which analyses corn starch-based coatings, it can be clearly seen that it is possible to incorporate a higher amount, i.e. more than 25 wt.% glycerol, into the system and maintain almost unchanged tensile strength, modulus of elasticity and elongation at break results. Even though the author added only up to 1.8 wt.% glycerol, such a small amount must have resulted in brittle coatings, as shown by the current study, which found that glycerol contents near 0 wt.% result in brittle products.

Considering water absorption, rice starch coatings Wang et al. (2025) showed values almost twice those of the current study at the same glycerol content. The achievement can be explained by the fact that rice starch contains more branched amylopectin. It forms a more open, porous structure that more easily entraps water molecules. Phosphate groups in different starches also play a vast role in moisture-related properties, such as water solubility. For instance, corn starch analysed in the current study lacks ionising phosphate groups. Therefore, the molecules are more tightly packed, making it harder for water molecules to penetrate. However, potato and wheat starches analysed in the Basiak et al. (2018) and Fu et al. (2021) studies, respectively, contain phosphate groups that carry a negative electrical charge. Like-charges repel each other; therefore, the starch granules are pushed apart, allowing water molecules to wedge themselves into a granule more easily, thereby increasing solubility.

4. Conclusions

The current study revealed that corn starch- and glycerol-based biologically-derived coatings for possible wood surface modification determine:

- lower tensile strength and modulus of elasticity due to glycerol's ability to weaken starch-starch chains. Up to 75 wt.% glycerol does not impact the elongation at break value. However, higher glycerol content leads to overplasticization of the resulting biologically-derived coatings.
- up to 266% higher moisture content in coatings. From 130% to 60% reduced water absorption and from 4% to 47% increased water solubility, which can be explained by the glycerol's hygroscopic nature and tendency to dissolve in water rather than absorb it.
- further studies of biologically-derived coatings should include the monitoring of pH and electrical conductivity values of water solutions for a better understanding of the neutral-alkaline environment and ion mobility impact during different soaking in water intervals.
- dispersion analysis of the moisture-related results can be approximated by the regression equations, which can be further used to predict water absorption and water solubility changes at different test time intervals and glycerol contents.
- 75 wt.% glycerol content in corn starch coatings showed promising results; however, further modification of the coatings is necessary to consider their application for wood surface modification.

Author contributions

Conceptualisation, A. L.; methodology, A. L. and A. K. (Agnė Kairytė); software; A. K. (Agnė Kairytė) and S. V; validation, A. K. (Agnė Kairytė), A. K. (Arūnas Kremensas) and S. V.; formal analysis, A. L. and A. K. (Agnė Kairytė); investigation, A. L., A. K. (Arūnas Kremensas) and S. V.; resources, A. L. and A. K. (Agnė Kairytė); data curation, A. L., A. K. (Agnė Kairytė), A. K. (Arūnas Kremensas) and S. V.; writing, A. L. and A. K. (Agnė Kairytė); writing—review and editing, A. L., A. K. (Agnė Kairytė), A. K. (Arūnas Kremensas) and S. V.; visualisation A. L. and S. V.; supervision, A. K. (Agnė Kairytė). All authors have read and agreed to the published version of the manuscript.

Disclosure statement

The authors declare that they have no competing financial, professional, or personal interests with any other parties.

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BIOLOGINĖS KILMĖS KUKURŪZŲ KRAKMOLO IR GLICERINO DANGOS GALIMAM MEDIENOS PAVIRŠIAUS MODIFIKAVIMUI: STIPRUMINIŲ IR DRĖGMINIŲ SAVYBIŲ ANALIZĖ

Santrauka. Šiame tyrime analizuojamas kukurūzų krakmolo ir glicerino pagrindu pagamintų dangų galimas pritaikymas medienos paviršiams, siekiant įvertinti teigiamą ar neigiamą tokių dangų poveikį ir būtinybę jas modifikuoti, norint jas sustiprinti ir pagerinti drėgmines savybes. Nustatyta, kad 100 % viršijantis glicerino kiekis kukurūzų krakmolo dangose lemia nuo 2,7 MPa iki 1,2 MPa sumažėjusį tempimo stiprį ir nuo 28 MPa iki 6,3 MPa – tamprumo modulį, o dangų pailgėjimas prieš nutrūkstant išlieka nepakitęs, kai glicerino kiekis yra iki 75 %. Be to, įrodyta, kad didžiausias glicerino kiekis dangų kompozicijose padidina drėgmės kiekį daugiausia 266 %, o atliktas tyrimas atskleidė sistemingo glicerino polinkio sudaryti vandenyje tirpias dangas poveikį vandens sugerties vertėms, kurios sumažėjo iki 60 %, kai tirpumas vandenyje padidėjo iki 47 %. Mechaninių ir drėgminių savybių rezultatai leido padaryti išvadą, kad biologinės kilmės dangoms, skirtoms medienos paviršiui modifikuoti, būtinas apdorojimas hidrofobines savybes gerinančiais aliejais.

Reikšminiai žodžiai: biologinės kilmės dangos, kukurūzų krakmolas, glicerinas, medienos modifikavimas, biokompozitinės sistemos, drėgminės savybės, tempimo savybės.