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RESEARCH ARTICLE

Cellulolytic activity of *Schizophyllum commune* (*Schizophyllaceae*) and its potential for the saccharification of oat straw

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Abstract. Induction of cellulolytic enzyme systems in four strains of *Schizophyllum commune* (IBK 2904, IBK 2905, IBK 2906, and IBK 2907) cultivated on lignocellulosic substrates and their efficiency in oat straw saccharification were studied. The fungi were grown on Norcrans medium containing 1% alder sawdust or 1% oat straw as inducers of enzyme synthesis. It has been demonstrated that oat straw is a more effective inducer of cellulase production. Endoglucanase activity reached 109.60 U/g_{DM} in strain 2904 and 103.39 U/g_{DM} in strain 2905 on oat straw, compared with 78.64 U/g_{DM} and 92.26 U/g_{DM} on alder sawdust. Carboxymethylcellulase activity increased up to 2.6-fold under oat straw induction, with a maximum value of 245.75 U/g_{DM} for strain 2904. Filter paper activity was moderately higher on oat straw, reaching 23.90 U/g_{DM} in strain 2906. Supernatants obtained after cultivation on medium with oat straw provided higher efficiency of oat straw saccharification (7.87% for strain 2904), whereas supernatants obtained after cultivation on medium with alder sawdust increased saccharification efficiency to 3.95%. The highest substrate mass loss after 48 h of hydrolysis (9.30%) was recorded for strain 2905 cultivated on oat straw. The results indicate the potential of *S. commune* 2904 grown on oat straw-containing medium for the production of efficient enzyme preparations applicable to lignocellulosic biomass conversion.

Keywords: bioconversion, cellulase, enzyme, hydrolysis, macromycetes

Introduction

The bioconversion of lignocellulosic biomass (encompassing cellulose, hemicelluloses, and lignin) into fermentable sugars is a cornerstone of bioethanol production and other biorefinery processes. This multi-stage pathway typically involves pre-treatment to disrupt recalcitrant structures, followed by

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enzymatic saccharification and microbial fermentation (Halysh et al., 2025a, 2025b; Pereira Junior, 2026). Amid rising fossil fuel prices and escalating greenhouse gas emissions, lignocellulosic materials offer a promising, low-cost alternative for biofuel generation, promoting environmental sustainability (Bukhari et al., 2025).

Cellulose, the principal structural polysaccharide in plant cell walls, represents the most prevalent organic polymer on Earth and serves as a vital renewable feedstock for sustainable biotechnologies (Sreedharan, 2016; Benalaya et al., 2024). Composed of linear chains of D-glucose units interconnected by β-1,4-glycosidic linkages, cellulose exhibits high crystallinity and resistance to degradation, necessitating efficient enzymatic breakdown for industrial applications (Abolore et al., 2024).

Enzymatic hydrolysis, mediated by cellulases, stands out as an energy-efficient and eco-friendly saccharification strategy, with outcomes modulated by parameters like pH, temperature, substrate accessibility, and enzyme specificity. However, the high cost of cellulases contributing up to 48% to bioethanol production expenses drives the need for novel, cheaper enzyme sources (Mussatto et al., 2021; Santos et al., 2026).

Cellulolytic enzymes are synthesized by plants, select animals, and diverse microorganisms including protozoa, bacteria, and fungi (Ejaz et al., 2021). Fungal systems have garnered substantial attention for their superior cellulase yields, with ascomycetes such as *Aspergillus* P. Micheli ex Haller, *Penicillium* Link, *Rhizopus* Ehrenb., and *Trichoderma* Pers. dominating commercial production due to their well-characterized enzyme complexes (Sreedharan, 2016). Nonetheless, basidiomycete fungi, particularly macrofungi, or mushrooms, excel in lignocellulose degradation in natural ecosystems, where they colonize decaying wood, leaf, and other cellulose-enriched substrates (Boiko, 2020). These organisms deploy enzyme arsenals to dismantle complex biopolymers like cellulose, hemicelluloses, lignin, and pectin, enabling efficient nutrient cycling (Zubyk et al., 2025). Strain-specific genetic variability and substrate-inducible expression underpin their cellulolytic prowess, making them adaptable to varied environmental cues (Boiko, 2020; Kumla et al., 2020).

Extensive research has highlighted the efficacy of basidiomycetes in cellulases production via solid-state fermentation (SSF) on agro-industrial or forestry residues, leveraging their natural saprotrophic lifestyles (Sharma, Duggirala, 2020). Substrates such as wheat, sorghum, or rice straw; oak or pine sawdust; peanut hulls; mandarin peels; cotton waste; corn stover; and others have proven effective for inducing enzyme synthesis. Notable genera, including *Auricularia* Bull., *Flammulina* P. Karst., *Fomes* (Fr.) Fr., *Ganoderma* P. Karst., *Irpex* Fr., *Laetiporus* Murrill, *Lentinula* Earle, *Pleurotus* (Fr.) P. Kumm., *Schizophyllum* Fr., and *Trametes* Fr., have been cultivated on these wastes, yielding robust cellulase activities through SSF (Bentil et al., 2018; Boiko, 2020; Zubyk et al., 2025). This valorization of lignocellulosic byproducts not only mitigates waste accumulation but also aligns with circular economy principles by converting low-value materials into high-value ones (Akinbile et al., 2026).

While SSF mimics natural fungal habitats and facilitates high enzyme titres on solid substrates, submerged fermentation (SmF) presents complementary advantages for industrial scalability, including precise regulation of growth conditions (e.g., aeration, agitation, pH, temperature, and nutrient supply), enhanced mass transfer, and simplified downstream processing (Kowanga, 2026).

Schizophyllum commune, a cosmopolitan basidiomycete known for its rapid growth and versatile metabolism, is a model for studying cellulase biosynthesis. The secretome of *S. commune* is characterized by a balanced and diverse set of extracellular enzymes, including endoglucanases, exoglucanases, β-glucosidases, xylanases, polygalacturonases, lytic polysaccharide monooxygenases (LPMOs), and accessory enzymes, forming an efficient enzymatic complex for lignocellulosic biomass conversion. Compared to other wood-decaying fungi, *S. commune* demonstrates enhanced hydrolytic performance toward agricultural lignocellulosic residues, largely due to its strong hemicellulolytic and pectinolytic capacities (Kumar et al., 2022; Tovar-Herrera et al., 2018; Zhu et al., 2016).

Despite the predominance of ascomycete-derived commercial cellulases, insights into basidiomycete enzymology underscore their untapped potential for cost-effective saccharification processes. Comparative genomic analysis has demonstrated that this basidiomycete possesses one of the most comprehensive lignocellulose-degrading systems among studied *Basidiomycota*, including approximately 240 glycoside hydrolase (GH) genes, 16 polysaccharide lyases (PL), and 30 carbohydrate

esterases (CE), enabling efficient decomposition of cellulose, hemicellulose, and pectin-rich substrates (Ohm et al., 2010). Particularly noteworthy is the expansion of gene families such as GH28, GH43, PL1, PL3, and PL4, which are associated with pectin and hemicellulose degradation, distinguishing *S. commune* from many other basidiomycetes and conventional ascomycete enzyme producers.

The objective of this study was to assess the cellulolytic potential of *S. commune* strains cultivated via submerged fermentation on lignocellulosic substrates, characterize the crude multi-enzyme complexes for key activities, and evaluate their saccharification efficiency on plant biomass (oat straw).

Materials and Methods

The objects of study were strains of *Schizophyllum commune* deposited in the IBK Mushroom Culture Collection of the M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine: *S. commune* IBK 2904, *S. commune* IBK 2905, *S. commune* IBK 2906, and IBK *S. commune* 2907. The strains are stored on agarized malt extract agar (Mykchaylova et al., 2025).

The inoculum was prepared on a glucose-peptone-yeast medium with the following composition (g/L): glucose — 25.0, peptone — 3.0, yeast extract — 2.0, KH_2PO_4 — 1.0, K_2HPO_4 — 1.0, $MgSO_4 \cdot 7H_2O$ — 0.25; pH 6.5 (Lomberg et al., 2023; Mykchaylova et al., 2023).

To study the cellulolytic activity of fungal strains, a modified Norcrans liquid medium was used (g/L): NH_4NO_3 — 1.0, KH_2PO_4 — 1.0, $MgSO_4 \cdot 7H_2O$ — 0.5, $FeSO_4 \cdot 7H_2O$ — 0.005, $ZnSO_4 \cdot 7H_2O$ — 0.0044, $CaCl_2$ — 0.0055 with the addition of lignocellulosic components as carbon sources, namely: alder sawdust or oat straw (10.0 g/L) (Buchalo, 1988). The initial pH value was set at 6.8 ± 0.2 using 0.1 N NaOH and HCl solutions.

Five milliliters of inoculum were added to a 250 mL flask containing 50 mL of nutrient medium. Macromycetes were cultivated in static mode (without stirring) at a temperature of (28 ± 1) °C for 14 days (Lomberg et al., 2023).

At the end of cultivation, the biomass was separated from the culture liquid by filtration. The activity of cellulolytic enzymes in the culture liquid was determined by the amount of reducing sugars from specific substrates released during incubation (using the dinitrosalicylic method, according to the glucose calibration curve). To determine the activity of FPase (filter paper or total cellulase, EC 3.2.1.91), one strip of filter paper (FP, 1 cm × 6 cm) was used as the substrate. To determine the activity of CMCase (carboxymethylcellulase, EC 3.2.1.4) — 1% carboxymethylcellulose (CMC) solution. The unit of activity was taken as the amount of enzyme that releases 1 μmol of reducing sugars from the substrate per minute (Mohd Azmi et al., 2016). Endoglucanase activity (EC 3.2.1.4) was determined according to Dudka et al. (1982). The unit of activity was taken as the % decrease in viscosity of a 0.5% CMC solution per minute. Enzyme activity was calculated per 1 g of dry weight of the substrate used (U/g_{DM}).

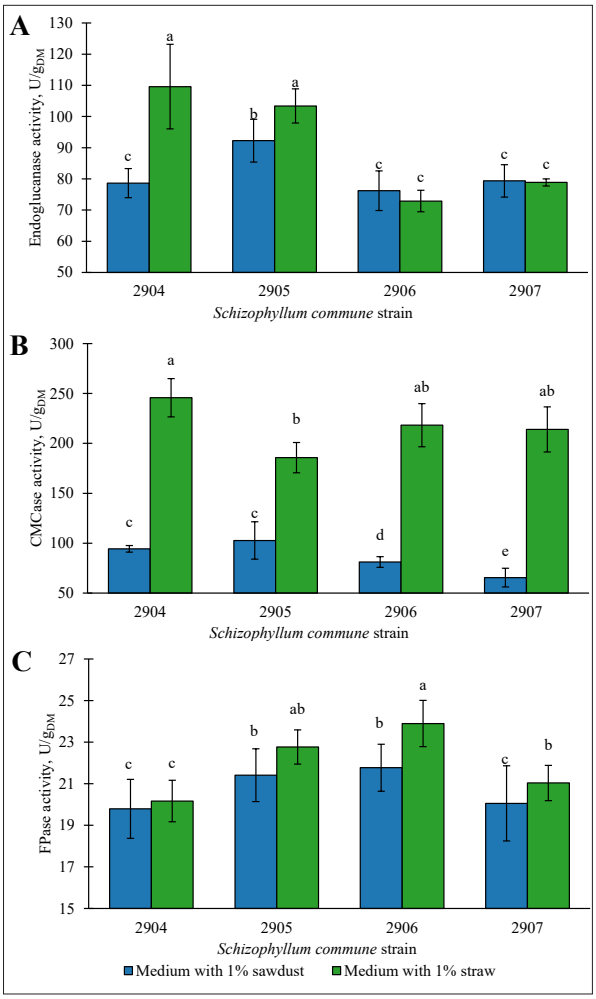


Fig. 1. Cellulolytic activity after cultivation of *Schizophyllum commune* on media with lignocellulosic waste. A: endoglucanase; B: CMCase; C: FPase

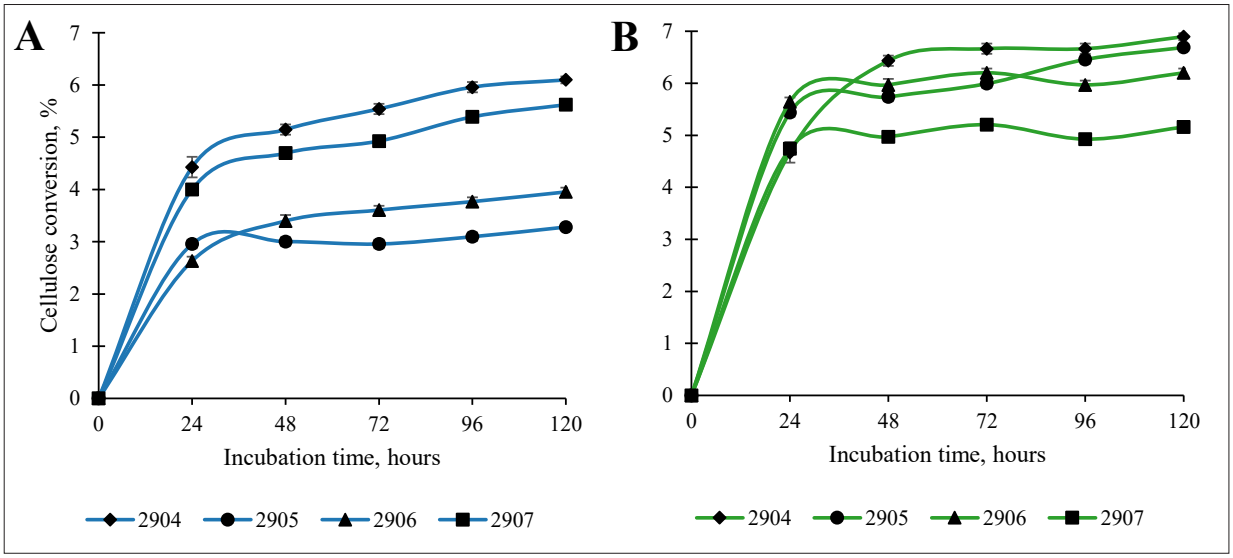


Fig. 2. Dynamics of oat straw saccharification by culture supernatants from *Schizophyllum commune* strains. A: alder sawdust-contained medium; B: oat straw-contained medium

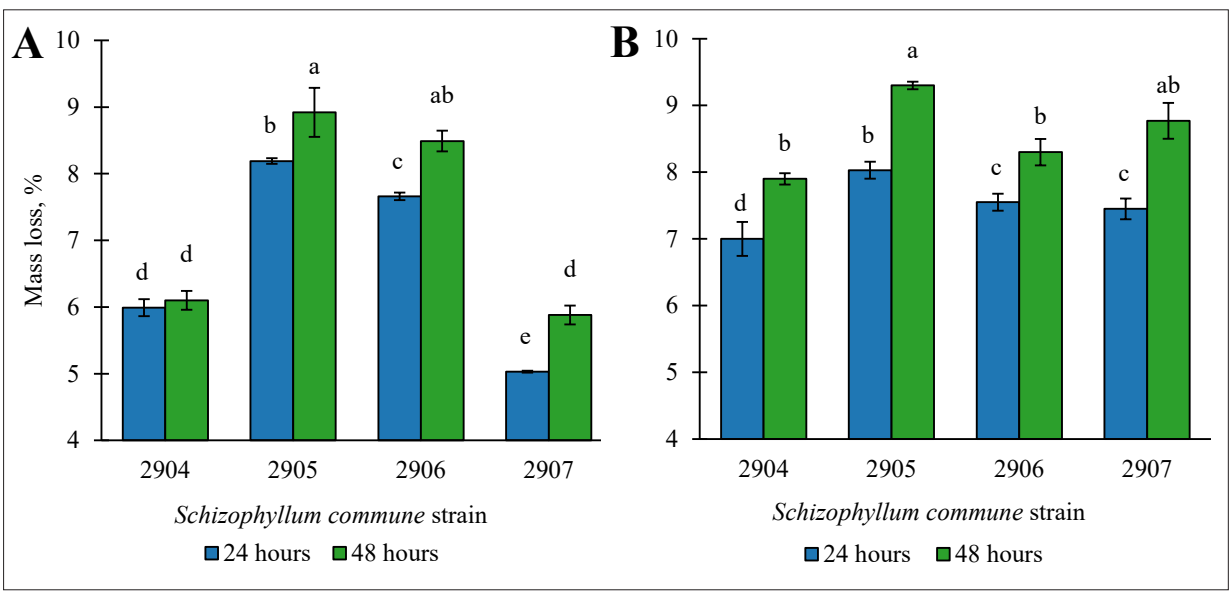


Fig. 3. Straw mass loss after enzymatic hydrolysis with culture supernatants from *Schizophyllum commune* strains. A: alder sawdust-contained medium; B: oat straw-contained medium

The lignocellulosic substrate (untreated oat straw) was saccharified by a modified method according to Cardoso et al. (2018). Shortly, 20 mL of culture liquid was added to 0.5 g of straw in 100 mL flasks. The amount of reducing sugars (using the method described above) released during enzymatic hydrolysis was determined in the reaction mixture, and the biomass was dried to a constant weight at (105 ± 5) °C. Then, the percentage of cellulose saccharification in oat straw was calculated according to Alrumman (2016) based on the previously determined cellulose content of the raw material (Halysh et al., 2025a, 2025b) and the mass yield of the substrate after treatment (Silva et al., 2015).

Statistical data processing was performed using Duncan's Multiple Range test. All experiments were performed in triplicate, and the results are presented as the mean ± standard deviation obtained from three measurements. The results were considered statistically significant at a p-value < 0.05. Letters *a*, *b*, *c*, *d*... in Figs. 1–3, 5 indicate significant differences between strains at $p < 0.05$ according to Duncan's Multiple Range test.

Data processing and graphing were performed using Excel software (USA).

Results

Schizophyllum commune strains 2904, 2905, 2906, and 2907 were cultivated on media containing lignocellulosic waste as inducers of cellulolytic enzyme synthesis.

Endoglucanase activity was higher in *S. commune* strains 2904 and 2905 when cultivated on oat straw compared to alder sawdust (Fig. 1A): for strain 2904, the value reached 109.60 U/g_{DM} on oat straw versus 78.64 U/g_{DM} on alder sawdust, and for strain 2905 — 103.39 U/g_{DM} on oat straw versus 92.26 U/g_{DM} on alder sawdust. In contrast, strains 2906 and 2907 demonstrated slightly higher activity when grown on alder sawdust: 76.21 U/g_{DM} versus 72.91 U/g_{DM} for strain 2906 and 79.35 U/g_{DM} versus 78.86 U/g_{DM} for strain 2907.

The lowest value of endoglucanase activity was observed for strain 2906 on oat straw (72.91 U/g_{DM}). The obtained values did not differ statistically from those recorded for strains 2904 and 2906 cultivated on alder sawdust-containing medium, as well as from strain 2907 grown on both induction substrates ($p > 0.05$).

CMCase activity was consistently higher in oat straw-supplemented media across all tested strains (Fig. 1B). The highest activity is observed in *S. commune* 2904 on oat straw (245.75 U/g_{DM}), nearly 2.6 times greater than on alder sawdust (94.34 U/g_{DM}). Similarly, *S. commune* 2905 shows a 1.8-fold increase on oat straw.

FPase activity increased moderately in oat straw-grown cultures compared to alder sawdust-grown variants (Fig. 1C). The most pronounced enhancement is observed in *S. commune* 2906, with activity rising from 21.77 U/g_{DM} on alder sawdust to 23.90 U/g_{DM} on oat straw, a relative increase of approximately 10%. Other strains show smaller increments, ranging from 2% to 6%.

The observed preference for oat straw as an inducer of cellulolytic activities suggests more effective stimulation of the synergistic cellulase complex under these conditions. Notably, the activities remain relatively uniform among strains, with the highest value recorded for *S. commune* 2906 on oat straw (23.90 U/g_{DM}) and the lowest for *S. commune* 2904 on alder sawdust (19.79 U/g_{DM}).

Because enzymatic activity reflects catalytic potential rather than actual substrate conversion, saccharification assays were performed to validate hydrolytic performance. In the saccharification experiment, a culture liquid with previously characterized cellulase activity was used as the enzyme source; oat straw was used as a lignocellulosic substrate to assess the intensity of oat straw bioconversion.

For *S. commune* 2905, saccharification using supernatant derived by cultivation with alder sawdust increased progressively from 4.43% at 24 hours to 6.10% at 120 hours (Fig. 2A). In contrast, the enzyme complex derived by cultivation with oat straw demonstrated higher efficiency, reaching 7.87% at 72 h (Fig. 2B). The supernatant from *S. commune* strain 2904 cultivated with alder sawdust yielded inconsistent results, fluctuating from an initial 2.96% at 24 hours to a peak of 3.28% at 120 hours. In the oat straw-derived counterpart, yields were elevated yet stabilized, progressing from 6.11% at 24 hours to 7.13% at 72 hours and hovering between 6.53% and 6.76% in subsequent intervals.

Strain 2907 showed a steady increase in saccharification induced by alder sawdust, from 2.63% at 24 hours to 3.95% at 120 hours. For the cultivated with oat straw, an accelerated early phase reached 5.20% at 72 hours, followed by a brief decline to 4.93% at 96 hours (possibly due to dynamic substrate-enzyme interactions). The supernatant from strain *S. commune* 2906 after cultivation on medium with alder sawdust demonstrated equilibrated performance, ascending from 4.00% at 24 hours through 4.69% at 48 hours, 4.93% at 72 hours, and 5.39–5.62% in the mid-to-late phases. Its counterpart on oat straw maintained steady advancement from 5.65% at 24 hours to 6.20% at 72 hours and 5.60–6.20%, devoid of notable regressions.

Saccharification kinetics revealed that the majority of reducing sugars were released within the first 24–48 hours of hydrolysis. During this period, the increase in yield was most pronounced across all variants, indicating the highest catalytic efficiency of the enzyme systems at the early stage of

substrate conversion. Beyond 48 hours, the rate of sugar release declined markedly, approaching a plateau phase. This stabilization suggests progressive limitation associated with substrate recalcitrance and depletion of readily hydrolysable polysaccharide fractions.

Given the limited increase in yield after 48 hours (Fig. 2), further prolongation of hydrolysis was considered technologically inefficient. Therefore, subsequent quantitative assessments of substrate mass loss and saccharification efficiency were focused on the 24 hours and 48 hours time points as the most informative and technologically relevant stages of bioconversion.

Substrate mass loss increased in all variants between 24 and 48 hours is caused by more active hydrolysis at the early stage of incubation (Fig. 3). However, the magnitude of this increase differed substantially among strains and induction conditions. For supernatants derived from alder sawdust-grown cultures, the highest oat straw mass reduction at 48 hours was observed for strain 2905 (8.92%) and strain 2906 (8.49%). Strain 2906 exhibited a moderate increase from 5.03% to 5.88%, whereas strain 2904 demonstrated minimal progression (5.99% to 6.10%), indicating limited hydrolytic enhancement after the initial 24 hours. In contrast, supernatants obtained from oat straw-grown cultures generally resulted in higher mass loss values. At 48 hours, strain demonstrated 9.30% mass loss, representing the highest overall degradation efficiency.

Strain 2907 also showed pronounced activity (8.77%), followed by strain 2906 (8.30%) and strain 2904 (7.90%). The increment between 24 and 48 h was particularly marked for strains 2905 and 2907 under oat straw induction, suggesting more effective formation of enzyme systems adapted to polysaccharide-rich substrates. Overall, enzyme systems induced by oat straw exhibited higher efficiency in degrading oat straw compared to those induced by alder sawdust. The only exception was strain 2907, for which the difference between induction substrates was negligible. These findings support the presence of substrate-specific regulation of extracellular enzyme complexes in *S. commune*, influencing subsequent hydrolytic performance.

Discussion

Our findings reveal a substrate-dependent modulation of enzyme activities, where oat straw generally elicited superior endoglucanase, CMCase, and FPase production compared to alder sawdust, aligning with the notion that agricultural residues like straw, rich in accessible cellulose and hemicelluloses, serve as more potent inducers for fungal cellulase systems. This preference is evident in strains 2904 and 2905, which exhibited 1.4-fold and 1.1-fold higher endoglucanase activities on oat straw versus alder sawdust, potentially attributable to straw's lower lignin content (12.9–18.1 %), in contrast to sawdust's higher lignification (22.0–37.3 %) imposing steric constraints (Szadkowska et al., 2022; Rencoret et al., 2023; Halysh et al., 2025a, 2025b; Santos et al., 2026). Conversely, strains 2906 and 2907 displayed marginal advantages on sawdust, suggesting strain-specific adaptations to woody substrates, possibly linked to enhanced expression of accessory lignin-modifying enzymes as reported in other basidiomycetes like *Pleurotus ostreatus* (Jacq.) P. Kumm, where sawdust induced higher laccase but variable cellulase outputs (Han et al., 2020). The uniformity in FPase activities across strains (19.79–23.90 U/g_{DM}), with modest 2–10% enhancements on straw, underscores the synergistic nature of the cellulase complex, where straw's hemicellulose components may stimulate complementary hemicellulases, echoing observations in *Phanerochaete chrysosporium* Burds where inducers like wheat straw boosted overall filter paper degradation by 5–15% (Datsomor et al., 2022). CMCase, a targeted measure of endoglucanase on soluble substrates, amplified this trend with 1.8–3.3-fold increases on straw, peaking at 245.75 U/g_{DM} for strain 2904, which surpasses values reported for *S. commune* mutants on cellulosic substrates (e.g., 100–150 U/g_{DM} on bagasse), highlighting the efficacy of straw as an inducer in solid-state-like fermentations.

Metreveli et al. (2021) reported that polysaccharide composition of the cultivation substrate serves as a primary determinant of extracellular enzyme secretion profiles in basidiomycetes, with agricultural residues generally stimulating higher cellulase production than woody substrates due to their lower lignin content and greater accessibility of cellulose and hemicellulose fractions. This observation corresponds closely with the present findings, where oat straw consistently promoted higher CMCase, FPase, and, for most strains, endoglucanase activity compared with alder sawdust. Oat straw likely provides more accessible cellulose microfibrils and a more favorable lignin-to-polysaccharide ratio, facilitating induction of cellulolytic gene

expression and secretion of a more effective hydrolytic enzyme complex.

Similarly, Kachlishvili et al. (2020) demonstrated that the enzymatic productivity of higher basidiomycetes is strongly affected by cultivation parameters, including substrate form, inoculum characteristics, and nutrient adaptation, emphasizing the importance of physiological conditioning in enzyme biosynthesis. The strain-specific differences observed in this study, particularly the superior hydrolytic performance of strains 2904 and 2905 on oat straw, support the notion that genetic and physiological variability among *S. commune* strains significantly determines their substrate responsiveness and enzyme production efficiency.

Translating these *S. commune* enzymatic potentials to practical bioconversion, saccharification assays using culture supernatants on oat straw demonstrated that straw-induced enzymes consistently outperformed sawdust-induced enzymes, achieving average yields of 7.13% versus 4.74% at 120 hours. This corroborates literature data for *S. commune*, where straw induction enhanced saccharification of pretreated biomass by 20–30% due to a balanced complex of cellulases, pectinases, and LMEs, as seen in studies yielding 15–25% glucose release from wheat straw (Zhu et al., 2016). Strain 2904 emerged as the superior performer on straw (7.87% maximum at 72 hours), reflecting robust induction akin to *S. commune* IBL-06 optimized on rice straw for LME production, where similar kinetics led to 8–10% saccharification efficiencies (Asgher et al., 2016).

The rapid initial sugar release (0–48 hours) followed by plateaus post-96 hours indicates preferential hydrolysis of amorphous cellulose, with crystalline fractions and potential end-product inhibition (e.g., cellobiose) limiting late-stage gains, a common bottleneck in fungal bioconversion as noted in consolidated biological processing (CBP) with *S. commune* on cedar wood, achieving only 5–8% ethanol yields without supplementation (Horisawa et al., 2015). Strains 2906 and 2907 exhibited steady hydrolysis advancements, with induction by straw 6.76% and 7.38% at 120 hours, respectively, comparable to reports of 7–9% digestibility enhancements treated with *S. commune* laccases of paddy and wheat straw (Sornlake et al., 2017).

Substrate mass loss further validated these efficiencies, with straw-induced supernatants causing 7.90–9.30% reductions at 48 hours, peaking for strain 2905 (9.30%), exceeding sawdust variants (6.10–8.92%). This selective degradation, minimal for strain 2904 on sawdust (6.10%), aligns with the white-rot strategy of *S. commune*, where straw fosters lignin delignification, enhancing *in vitro* digestibility as observed for paddy and finger millet straws (Kumar et al., 2022). Compared to literature, our yields (up to 7.87%) are modest against theoretical 40–50% cellulose conversion, yet they surpass untreated baselines (2–5%) and approach optimized CBP systems, underscoring the need for pretreatment (e.g., alkaline) to mitigate recalcitrance, as demonstrated in *S. commune* on wheat bran yielding 1.162 mg/mL glucose from rice straw (Kumar et al., 2018). The negligible difference for strain 2907 between inducers suggests broader substrate adaptability, potentially exploitable in mixed waste media.

Conclusions

This study demonstrates that oat straw is a significantly more effective inducer of cellulolytic enzymes for *Schizophyllum commune* strains 2904, 2905, 2906, and 2907 than alder sawdust. Strains 2904 and 2905 showed the highest endoglucanase activity on oat straw (109.60 U/g_{DM} and 103.39 U/g_{DM}, respectively), while CMCase activity increased 1.8–2.6-fold across all strains in oat straw-supplemented medium, reaching its maximum of 245.75 U/g_{DM} in strain 16. FPase activity was moderately higher on oat straw, with the largest gain recorded for strain 2906 (23.90 U/g_{DM}).

The best saccharification performance was achieved by strain 2904 (a maximum of 7.87% at 72 hours). The majority of reducing sugars were released within the first 48 hours, after which the process reached a plateau, indicating that prolongation beyond 48–72 hours is technologically inefficient. Substrate mass loss at 48 hours further confirmed these findings: oat straw-induced supernatants caused 7.90–9.30% degradation.

Thus, the present research identifies *S. commune* 2904 cultivated on synthetic medium with 1% oat straw as the most promising system for cellulase production and subsequent saccharification of lignocellulosic biomass under the tested conditions. Future work should focus on alkaline or biological pretreatment of substrates thereby advancing cost-effective, sustainable biofuel and bioproduct platforms.

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ETHICS DECLARATION

The authors declare no conflict of interest.

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Целюлолітична активність *Schizophyllum commune* (*Schizophyllaceae*) та перспективи його застосування в оцукрюванні вівсяної соломи

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Реферат. Досліджено індукцію целюлолітичних ферментних систем кількох штамів *Schizophyllum commune* (IBK 2904, IBK 2905, IBK 2906 та IBK 2907), які культивували на лігноцелюлозних субстратах, та їхню ефективність в оцукрюванні вівсяної соломи. Гриби культивували на середовищі Норкранс, що містило 1% вільхової тирси або 1% вівсяної соломи як індуктори синтезу ферментів. Було продемонстровано, що вівсяна солома була більш ефективним індуктором продукції целюлази. Активність ендоглюканази досягла 109,60 од/г$_{СР}$ для штаму 2904 та 103,39 од/г$_{СР}$ для штаму 2905 на вівсяній соломі порівняно з 78,64 од/г$_{СР}$ та 92,26 од/г$_{СР}$ на вільховій тирсі. Активність карбоксиметилцелюлази збільшилася до 2,6 раза при індукції вівсяною соломою, з максимальним значенням 245,75 од/г$_{СР}$ для штаму 2904. ФПазна активність була вищою на вівсяній соломі, досягаючи 23,90 од/г$_{СР}$ у штамі 2906. Фільтрати, отримані після культивування на середовищі з вівсяною соломою, забезпечили вищу ефективність оцукрювання вівсяної соломи (7,87% для штаму 2904), тоді як фільтрати, отримані після культивування на середовищі з вільховою тирсою, підвищили ефективність оцукрювання до 3,95%. Найбільша втрата маси субстрату після 48 годин гідролізу (9,30%) була зафіксована для штаму 2905, який культивували на вівсяній соломі. Результати вказують на потенціал *S. commune* 2904 при культивуванні на середовищі, яке містить вівсяну солому, для виробництва ефективних ферментних препаратів, що використовуються для конверсії лігноцелюлозної біомаси.

Ключові слова: біоконверсія, гідроліз, макроміцети, фермент, целюлаза