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EVALUATION OF PECTINOLYTIC ACTIVITY AND GROWTH OF *Trametes versicolor* AND *Trametes ochracea* STRAINS ON PECTIN-CONTAINING AGARIFIED MEDIUM

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The study of basidiomycete growth on pectin-containing agar media and the synthesis of pectolytic enzymes is crucial for selecting promising strains.

Aim. The study was purposed to evaluate basidiomycetes' growth dynamics and enzymatic activity from the *Trametes* genus in surface culture on agar media supplemented with pectin.

Methods. The radial growth rates of *T. ochracea* and *T. versicolor* strains were cultivated on peptone-yeast agar media with pectin (PPYA) at initial pH values of 5.0 and 7.0. Pectinase activity was determined by a semi-quantitative method using cetylmethylammonium bromide, and the pectinase activity index (PAI) was calculated.

Results and Discussion. Among *T. ochracea* strains cultivated on PPYA at pH 5.0, the highest growth rate was observed for strain 5302 (7.56 ± 0.41 mm/day). At pH 7.0, strain 1561 exhibited the highest growth rate (6.63 ± 0.29 mm/day), whereas strain 5300 showed the lowest growth rate at both pH values. For *T. versicolor*, strains 353, 1589, and 5095 exhibited the highest growth rates on PPYA at pH 5.0 (9.97 ± 0.44 mm/day), with strain 353 demonstrating the highest growth rate at pH 7.0 (11.67 ± 0.47 mm/day). The maximum PAI values among *T. ochracea* strains were observed in strains 1561 and 1570 (0.85-1.05), while for *T. versicolor*, strain 5094 demonstrated the highest PAI (1.07 ± 0.04). The results indicated that the growth rate on pectin-based media does not consistently correlate with the level of pectolytic enzyme synthesis. *T. versicolor* strains showed no clear correlation, whereas *T. ochracea* exhibited moderate correlations: a negative correlation on pH 5.0 media and a positive correlation on pH 7.0 media between pectinase activity and radial growth rate.

Conclusions. Among *T. ochracea* strains, 5302 showed the highest growth rate at pH 5.0, while strain 1561 had the highest at pH 7.0. Most *T. versicolor* strains, except strain 5161, had higher growth rates across both pH levels, with strains 353, 1689, and 5095 showing exceptionally high rates. Strain 5094 of *T. versicolor* exhibited the highest pectinase activity at pH 7.0. These findings highlight the potential for optimizing pH conditions to enhance the pectinase activity of *Trametes* strains.

Key words: macromycetes, *Trametes*, pectin, growth rate, pectolytic enzymes, enzymatic activity.

Pectin is a complex heteropolysaccharide composed of galacturonic acid, often esterified with methanol residues [1, 2]. As a critical component of the plant cell wall, this polysaccharide plays a crucial role in maintaining plant tissue's structural integrity and cohesion. The main classes of pectin polysaccharides, characterized by varying contents of D-galacturonic acid, are integral to ensuring the stability and cohesion of plant cells [3]. As a result, plant materials exhibit increased resistance to mechanical degradation, necessitating using enzymes, particularly pectinases, for their effective breakdown [4, 5].

Pectinase has garnered considerable scientific interest due to its effectiveness as a biocatalyst across various industries [6]. Its ability to degrade pectin, the primary component of plant cell walls, makes this

enzyme essential in applications such as the production of highly transparent fruit juices [7], the processing of plant biomass [8], paper industry [9], and the fermentation of cocoa, coffee, and tea [10]. Beyond its industrial applications, pectolytic enzymes play a significant role in natural ecosystems by facilitating the decomposition of plant residues and maintaining the balance of organic matter in the environment [11].

Pectinase is a complex enzymatic system that includes polygalacturonases, pectin esterases, and pectin lyases, all of which specialize in the degradation of pectin substances [12]. These enzymes cleave the glycosidic bonds in polygalacturonic acid, converting it into monomers, thus significantly simplifying the subsequent degradation process [13].

A broad range of microorganisms, including bacteria, filamentous fungi, and yeasts, are capable of synthesizing pectinases [12]. Among these, species from the genus *Aspergillus*, particularly *A. niger*, along with certain species of *Penicillium* and bacteria from the genus *Bacillus*, are widely utilized in industrial applications [14].

Bacterial producers such as *Serratia marcescens*, *Lysinibacillus macrolides*, and representatives of the genera *Bacillus*, *Pseudomonas*, *Erwinia*, and *Streptomyces* have demonstrated high rates of pectate lyase and pectin esterase synthesis, especially when cultivated in media containing pectin [7, 15, 16]. Notably, bacterial strains from the genera *Bacillus* and *Erwinia* have exhibited high levels of pectolytic enzyme activity, making them promising candidates for further study [15, 16]. Fungal producers, such as *A. niger*, *A. flavus*, and *P. chrysogenum*, are also known for their high pectolytic activity, particularly in submerged cultures [14, 17].

Despite substantial progress in the study of bacterial and fungal producers of pectolytic enzymes, the search for novel producers among biotechnologically relevant organisms, particularly basidiomycetes, remains active [18]. *Trametes* species are frequently employed in biotechnology due to their ability to synthesize a range of biologically active compounds with potential applications in pharmaceuticals, including antioxidant, antimicrobial, and anticancer agents [19]. In particular, a comprehensive study of 6 of 6 species of *Trametes* growth of macro *mycetes* on different nutrient media in order to select the most active strains was carried out in the paper by Klechak et al. [20].

Basidiomycetes, including *Trametes* species, are promising candidates due to their unique enzymatic profiles, capable of breaking down a wide range of complex plant materials. *Trametes*, known for their robust oxidase and hydrolase production, have demonstrated particular effectiveness in applications such as bioremediation and waste management [21]. Our previous study confirmed that macromycetes of the *T. versicolor* species are active producers of laccase, peroxidase, and tyrosinase [22].

In basidiomycetes, pectolytic enzyme activity is predominantly studied in submerged culture. Xavier-Santos et al. conducted a quantitative screening of 75 strains of wood-degrading macrofungi for their ability to synthesize polygalacturonase in submerged cultures [23]. Additionally, the synthesis of polymethylgalacturonase, polygalacturonase, and pectin lyase has been explored in *T. trogii*, while *T. sanguinea* and *T. versicolor* have been reported to produce rhamnogalacturonase and polygalacturonase, respectively [24–26].

Primary screening remains a crucial step in identifying active enzyme producers. It is carried out by culturing objects on agarified media with pectin as the only carbon source. The optimal induction of pectinases in surface culture is influenced by two factors: pectin concentration and initial pH. Most often, pectin is added to the medium in the amount of 0.5% [27, 28] and 1% [29–31]major importance was being attached to the use of enzymes in upgrading quality, increasing yields of extractive processes, product stabilization, and improvement of flavor and byproduct utilization. Pectinases or pectinolytic enzymes are today one of the upcoming enzymes of the commercial sector. It has been reported that microbial pectinases account for 25% of the global food enzymes sales. For this reason, this study was undertaken with aims of screening microorganisms for the pectinase activity from coffee pulp samples and molecular identification of the potential pectinolytic isolates. In the present investigation, in total, ninety-five (95. The initial pH value of the medium is set at 4.5–5.0 [32, 33], 6.8–7.0 [34], 9 [35].

In the study of fungi as producers of pectinases, media with 0.5% pectin and pH 5.0 [32], 1% pectin and pH 4.5 [33], 1% pectin and pH 5.5–6.0 [36], 1% pectin and pH 6.8–7.0 [37] were used.

If macromycetes are the objects of study, media with 0.5% pectin are more often used to detect pectinase activity [38]. In the

study of fungi, including macromycetes, the methods presented in Molitoris' research [39]. These results are demonstrated in the works of Ukrainian scientists in the study of macromycetes such as *Schizophyllum commune*, *Grifola frondosa*, and *Polyporus squamosus*. The available literature data on strains of these species relate to the qualitative analysis of pectinolytic enzymes. Agar media with 0.5 % pectin were used for the analysis by pH of 5.0 and 7.0, which are selective for the action of different types of pectinases [40–42].

The simplest method for detecting pectolytic activity involves qualitative analysis, which is frequently employed in the search for producers from bacterial genera such as *Bacillus* [29, 30, 35], *Paenibacillus* [31], and *Klebsiella* and *Chryseobacterium* [43]; as well as micromycetes such as *Rhizopus*, *Penicillium*, and *Aspergillus* [44]. Increasingly, isolates are selected based on the diameter of the pectin hydrolysis zone [7] or the ratio of this value to the colony diameter [29], i.e., by calculating the pectinase activity index.

For representatives of micromycetes, index values of more than 2 [36], more than 3 [45], and even more than 3.5 [46] have been reported. However, there are no similar studies for macromycetes in the literature.

Although research on the pectolytic activity of basidiomycetes has attracted some attention, the number of studies remains limited, particularly regarding species of the genus *Trametes*. The lack of comprehensive data on the potential of these fungi as pectinase producers highlights the need for further investigation. The aim of this study was to evaluate the growth and enzymatic activity of basidiomycetes of the genus *Trametes* in surface culture on agar media supplemented with pectin.

Materials and Methods

Objects

The objects of study were two species of the genus *Trametes*: *T. ochracea* (Pers.) Gilb. & Ryvarden 1561, 1570, 1521, 5302 (deposited as *T. zonatus*) and *T. versicolor* (L.) Lloyd 353, 1689, 5094, 5095, 5131, obtained from the IBK Mushroom Culture Collection [47].

Culture media

Growth and enzymatic activity were studied on peptone-yeast agar medium with pectin (Apfelpektin, Germany) as the sole carbon source (PPYA, pectin-peptone-yeast agar medium) composition (in g/l): pectin — 5, peptone — 3, yeast extract — 2, KH_2PO_4 — 1, K_2HPO_4 — 1, $MgSO_4 \cdot 7H_2O$ — 0,25. The initial pH for both media was set at 5.0 and 7.0 [29, 30].

Methods for surface cultivation and growth rate assessment

Macromycetes were cultivated on Petri dishes (90 mm in diameter) at a temperature of 28 ± 1 °C until the entire area of the Petri dish was overgrown. For culturing, a disc of mycelium of a 7-day-old culture pre-grown on PPYA was placed in the center of the dish. The mycelial growth was measured daily during the entire cultivation period in four mutually perpendicular directions. In the end, the radial growth rate (GR) was calculated:

$$GR = \frac{\Delta R}{\Delta \tau},$$

where ΔR — change in mycelium radius in the exponential growth phase, mm; $\Delta \tau$ — duration of the exponential growth phase, days [49].

Strain screening

For the analysis of pectinase activity, macro mycetes strains were cultured on PPYA petri dishes (90 mm in diameter) at 28 ± 1 °C for 3 days. After that, 5 ml of 1% cetyltrimethylammonium bromide (CTAB) solution was applied to the mycelium. After 2 hours, the excess CTAB solution was removed, and the pectinase activity index was calculated:

$$PAI = \frac{D_H}{D_C},$$

where D_H, D_C — are the diameters of the halo and colony, respectively, mm [50].

Statistical data processing

Two methods were used for statistical processing of the data. Duncan's test was used to compare data between strains on the same type of medium, which allows to determine significant differences between mean values. To compare the performance of one strain on two different media, a Student's *t*-test was used to assess the differences between two samples. All experiments were performed in triplicate, and the results were considered statistically significant at $P < 0.05$. To analyze the dependencies between changes in the growth rate and the pectinase activity index, Spearman's rank correlation coefficient was employed. Data processing and graphing were performed using R software (USA).

Results and Disscusion

The results demonstrate significant variability in the growth rate of *T. ochracea* strains, influenced by both the type of medium and the specific strain of basidiomycete. On pectin-peptone-yeast agar (PPYA) with a pH of 5.0, there were notable differences in the growth rates among the various strains (Fig. 1). Strain 5302 exhibited the fastest growth, reaching 7.56 ± 0.41 mm/day. However, for strains 1570 and 5021, no significant changes in growth rate were observed across the different media tested, with growth rates ranging between 5.54–6.27 mm/day and 6.65–7.20 mm/day, respectively.

On medium with pH 7.0, the growth rate of *T. ochracea* strains also demonstrated significant variability (Fig. 1). Strain 1561 exhibited the highest growth rate, reaching 6.63 ± 0.29 mm/day. Strains 1570, 5021, and 5302 showed similar growth patterns, with rates increasing from 5.97 ± 0.17 mm/day (strain 1570) to 6.40 ± 0.45 mm/day (strain 5302).

For *T. versicolor*, low variability in the growth rate was observed on the PPYA medium with pH 5.0. Most strains demonstrated similar growth rates (Fig. 2). The highest rates were recorded for strains 353, 1589, and 5095, with growth rates of 9.97 ± 0.44 mm/day, 9.89 ± 0.41 mm/day, and 9.89 ± 0.61 mm/day, respectively. The slowest growth was exhibited by strain 5131.

The growth rate of *T. versicolor* strains varied significantly on the PPYA medium with pH 7.0 (Fig. 2). Strains 1689 and 5095 demonstrated the highest growth rates, ranging from 8.97 mm/day to 10.53 mm/day. In contrast, strain 5131 exhibited a notable difference in radial growth rate compared to the other strains, with a growth rate of 7.33 ± 0.34 mm/day.

In addition to growth rate analysis, a semi-quantitative assay was conducted to assess pectinase activity by measuring the ratio of the diameter of the pectin-free hydrolysis zone to the diameter of the mycelium. This assay allowed for the identification of strains with high enzymatic activity, and the results are presented in Fig. 3.

For *T. ochracea*, strains 1561 and 1570 demonstrated the highest pectinase activity index (PAI) on a medium with pH 5.0, both showing values of 0.98 ± 0.06, indicating a strong potential for pectinase synthesis (Fig. 3, *a*). At pH 7.0, strain 1561 again showed the highest pectinase activity, with a PAI ranging from 0.70 to 0.89. In general, the activity index for most strains was higher at medium with pH 5.0 than at pH 7.0. However, for strains 1561 and 5302, there were no statistically significant differences between the PAI values at the two pH levels, suggesting a consistent level of pectinase activity across different pH conditions for these strains.

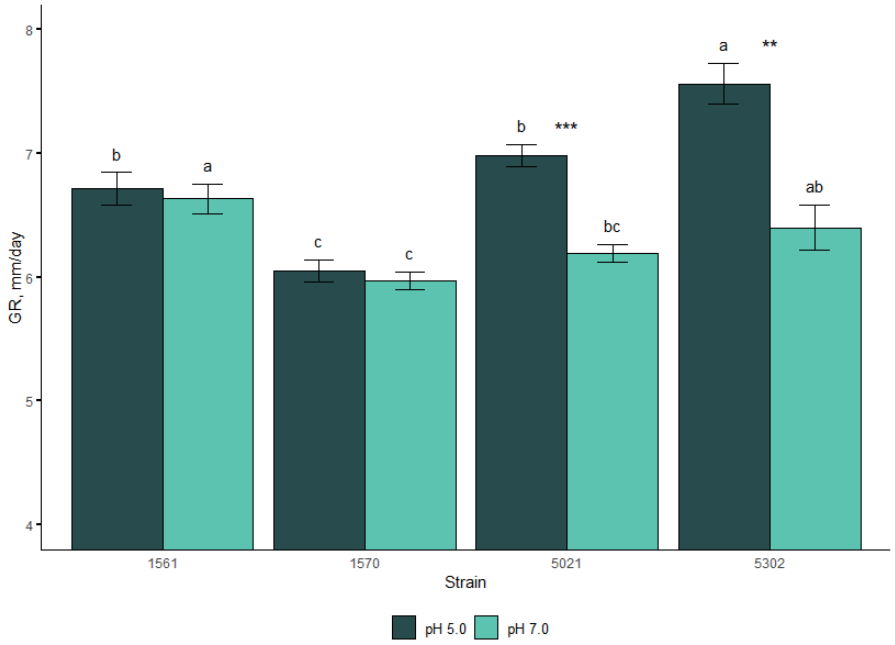

Fig. 1. **Radial growth rate of *T. ochracea* strains on PPYA**

All strains of *T. versicolor*, with the exception of strain 5131, exhibited similar PAI values when studied on medium with a pH of 5.0 (Fig. 3, *b*), ranging from 0.86 to 1.07. However, at pH 7.0, the strains demonstrated variability in pectinase activity, with the maximum PAI value observed in strain 5094 (1.07 ± 0.04). Overall, the synthesis of pectinases on both media was consistent across all strains of this species, with no statistically significant differences in enzymatic activity between the two pH conditions.

An analysis of the literature shows that the growth rate on pectin-containing media can correlate with pectinase activity. To establish these regularities, graphs of the dependence of PAI values on GR values were constructed (Fig. 4), which show the Spearman correlation coefficient.

For *T. ochracea* at pH 5, a moderate negative correlation was observed between the pectinase activity index and growth rate ($\rho = -0.80$), suggesting a tendency for enzymatic activity to decrease as the growth rate increases and vice versa. This indicates that, in a more acidic environment, enzymatic activity and growth rate may inversely affect each other. In contrast, at pH 7, the correlation between these metrics shifts to a moderately positive relationship ($\rho = 0.80$), implying that pectinase activity tends to increase alongside the acceleration of fungal growth.

For *T. versicolor*, unlike *T. ochracea*, the relationship between pectinase activity and growth rate is much weaker across both media. At both pH levels, the correlation is only weakly positive, indicating minimal interdependence between pectinase activity and growth rate for this species.

For the efficient assimilation of pectin as a structural component of wood, basidiomycetes have developed mechanisms for the release of extracellular pectinases [51, 52]. The synthesis of pectinases in culture is studied by cultivating objects on nutrient media with pectin as the only carbon source [53]. In our study, peptone-yeast agar medium with the addition of pectin at a concentration of 0.5 % was used for the cultivation of macromycetes of the genus *Trametes*. In this case, pectin serves as an inducer for the synthesis of pectinases [54].

The obtained results reveal significant variation in the growth rates of *T. versicolor* and *T. ochracea* species on pectin-containing media with different pH levels. On the medium with pH 5.0, *T. versicolor* exhibited the highest average growth rate, suggesting an efficient utilization of pectin as a carbon source and active induction of pectinases in the presence of pectin. This behavior aligns with previous findings for species like *Aspergillus niger*, *A. oryzae*, and *A. nidulans*, which also show

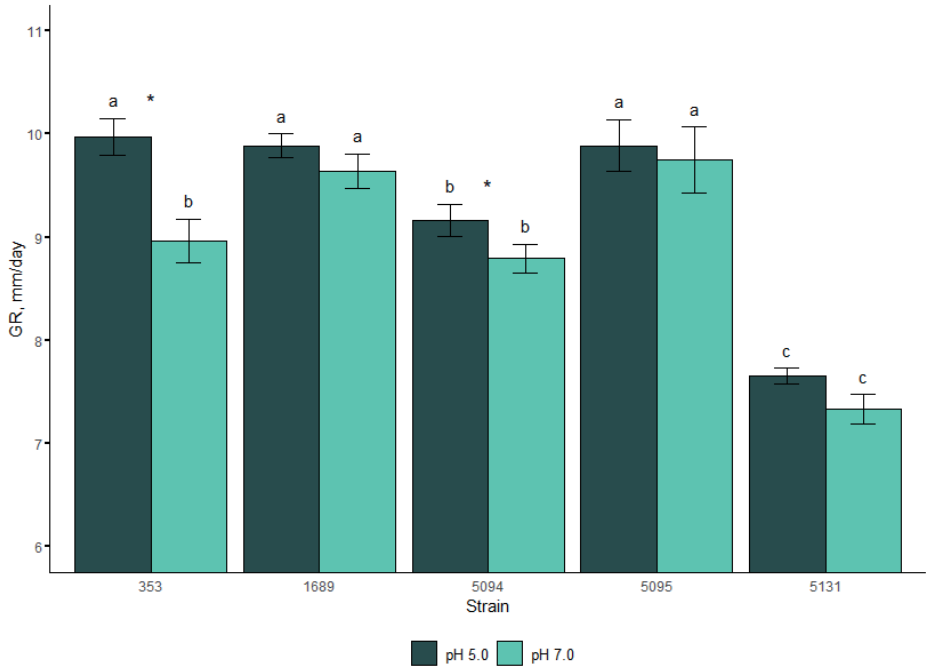

Fig. 2. **Radial growth rate of *T. versicolor* strains on PPYA**

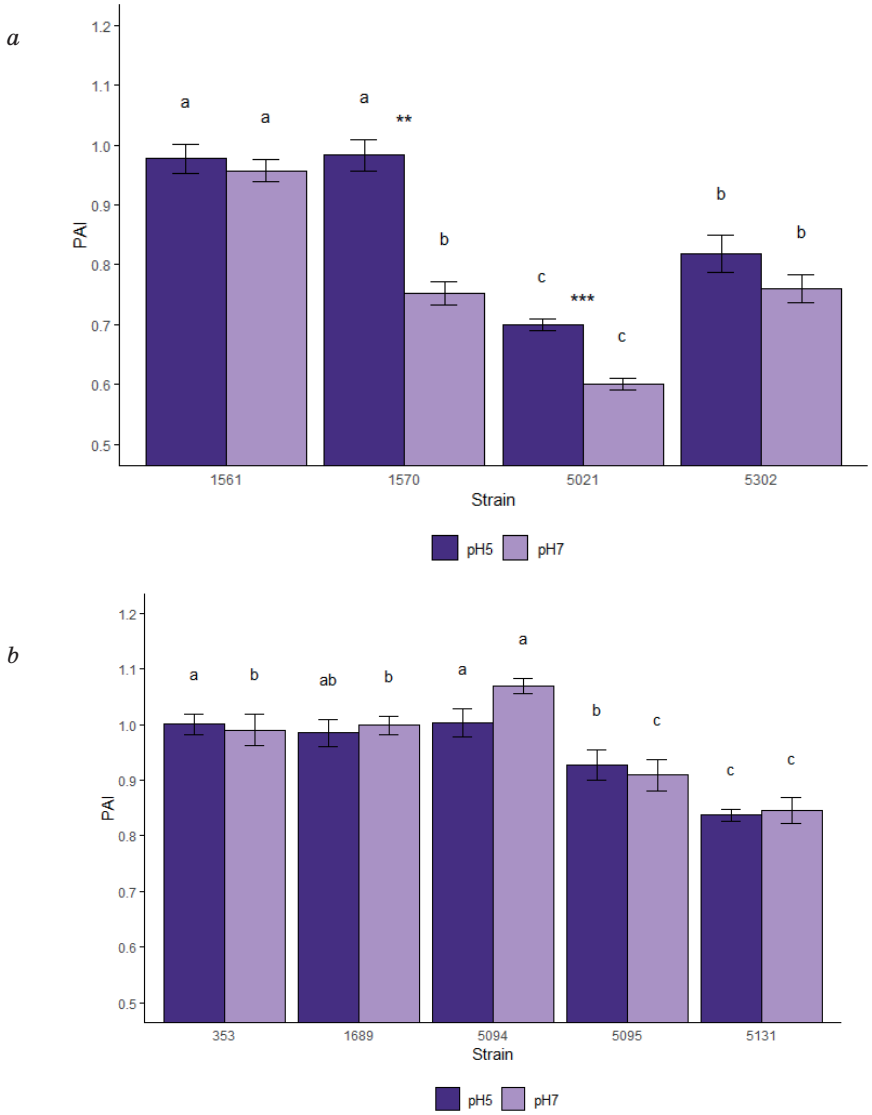

Fig. 3. **Pectinase activity of strains:** *a — T. ochracea; b — T. versicolor*

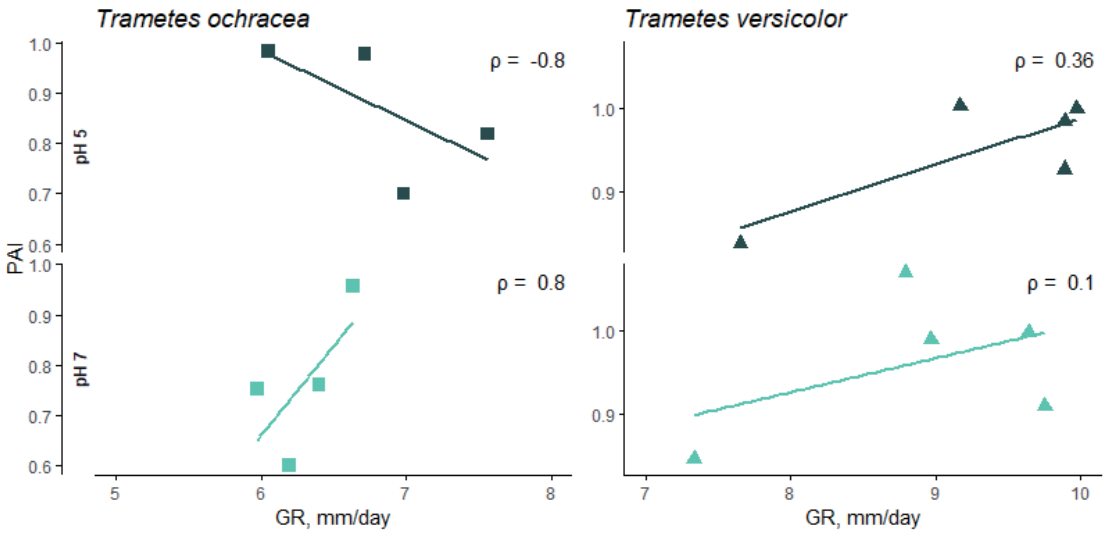

Fig. 4. **Dependence of pectinase activity on strain growth rate**

high activity on pectin-based media compared to other fungi [33, 55]. For *T. ochracea* strain 5302, which demonstrated a growth rate of 7.56 mm/day, elevated enzyme activity was recorded. This suggests that the strain is well adapted to conditions where pectin serves as the primary carbon source, potentially involving alternative metabolic pathways that support growth, even with lower growth rates. This observation is consistent with findings for other species, such as *Phanerochaete chrysosporium*, which produces lower quantities of pectinolytic enzymes compared to other fungi yet can still exhibit substantial growth on pectin-based media [55].

At pH 7.0, most of the studied strains showed a reduction in growth rate on pectin media compared to GPDA. This could be attributed to reduced induction of the pectinolytic enzyme complex at this pH [56]. While *T. versicolor* remained the fastest-growing species, its growth rate decreased to 8.50 mm/day on PPYA, suggesting a sensitivity of its enzyme systems to pH changes. On the other hand, strains of *T. ochracea* exhibited an increase in growth rate at pH 7.0, emphasizing the importance of selecting optimal pH conditions for maximizing the growth and enzyme activity of these species on pectin-containing media.

The observed decrease in the growth rate of microorganisms on media containing enzyme inducers like pectin can be attributed to the significant energy expenditure required for synthesizing these enzymes. The biosynthesis of pectolytic enzymes necessitates additional energy, which affects growth efficiency; resources needed for rapid cell division are redirected toward the synthesis of proteins and enzymes [57, 58]. Baró-Montel et al. demonstrated that the growth rate of *Monilinia laxa* mycelium varies significantly depending on the substrate type and pH. On potato glucose medium with glucose at pH 4.5, the average growth rate reached 10.1 mm/day, indicating high efficiency with this carbon source. Notably, when pectin was introduced, the growth rate increased to 12.7 mm/day. This suggests that similar to *M. laxa*, the addition of pectin can enhance growth rates in many strains of *T. ochracea* [59]. Wang et al. also reported that the radial growth rates of *Calcarisporium sp.* KF525 and *Scopulariopsis brevicaulis* LF580, when cultivated on pectin as the sole carbon source, surpassed those on glucose. However, the opposite trend was observed for strains such as *Tritirachium sp.* LF562, *Bartalinia robillardoides* LF550, *Penicillium pinophilum* LF458, and *Pestalotiopsis sp.* KF079 [60].

The semi-quantitative analysis showed that the PAI values for the studied macromycetes ranged from 0.60 to 1.07, which are notably lower than the values reported for micromycetes in the literature, where PAI values typically exceed 2 [36]. In addition to differences in cultivation conditions, these variations may stem from a more active metabolism and a higher number of pectinolytic enzyme genes in micromycetes [55].

Literature data also suggests that macromycetes often exhibit higher pectinase activity compared to micromycetes. For instance, in a comparative study of *P. notatum*, *Coriolus versicolor*, *Ganoderma lucidum*, *P. fellutanum*, *S. commune*, and *T. hirsuta*, higher pectinase activity was observed for all macromycetes (except *T. hirsuta*) when compared to *P. fellutanum*. Among the macromycetes, *C. versicolor* displayed the highest activity [61]. Consistent with these findings, this study identified *T. versicolor* as having the highest pectinase activity.

Significant differences in pectinase activity between strains within the same species were also observed, aligning with findings from previous studies on *C. versicolor* in solid-phase cultures [62]. In the current study, the strain *T. versicolor* 5094 demonstrated the highest pectinase activity. Interestingly, in our prior research on oxidase production by *T. versicolor* strains in surface cultures, strain 353 was the most productive, while strain 5094 showed somewhat lower values [22]. This suggests a specialization among strains in enzyme synthesis, where *T. versicolor* 353 may be more adapted to oxidase production, whereas strain 5094 exhibits a strong potential for hydrolase production, particularly pectinases. Such differentiation in enzymatic activity implies distinct ecological roles and adaptability to varying substrates in natural environments, which is a crucial consideration for their practical applications.

Conversely, the lowest PAI values were found in *T. ochracea* strains 338 and 359, indicating low expression of these enzymes. The differences in PAI values on media with varying pH may relate to the optimal acidity levels for the induction or maximal activity

of specific enzymes. For instance, increased induction and activity of polygalacturonase may occur at pH 5.0, while pectate lyase activity may peak at pH 7.0 [44, 45].

Literature data supports the notion that high PAI values are indicative of active pectinase producers. As part of a study of the pectinolytic activity of fungi of the genus *Aspergillus*, the authors analysed ten isolated strains obtained from soil [65]. The findings revealed interspecific variations in activity, underscoring the differing productivity of pectinolytic enzymes among strains. Notably, strains exhibiting larger halo diameters were correlated with higher pectinase activity in deep culture, reinforcing the relevance of assessing enzyme production potential in various microbial species.

Thus, among the strains studied in our work, *T. versicolor* 5094 emerged as the most promising potential producer of pectinases.

Conclusions

The study demonstrated that differences in the growth of various *Trametes* strains on media containing pectin and glucose at different pH values may be associated with varying levels of pectinase synthesis. Among the strains of *T. ochracea*, strain 5302 exhibited the highest growth rate on pectin-based media at pH 5.0, while strain 1561 showed the fastest growth at pH 7.0. In comparison, nearly all *T. versicolor* strains, with the exception of strain 5161, demonstrated higher growth rates across both pH levels than *T. ochracea*. Specifically, *T. versicolor* strains 353, 1689, and 5095 displayed the most rapid growth at pH 5.0, while strains 1689 and 5095 maintained the highest growth rates at pH 7.0.

Variability in pectinase activity indices was observed among *T. ochracea* strains, with the highest PAI values recorded for strain 1561 on both tested media. Strain 1570 exhibited a similar level of pectinase production on the medium with an initial pH of 5.0. Among the *T. versicolor* strains, strain 5094 displayed the highest pectinase activity on medium with pH 7.0, while a significant number of strains, including 353, 1689, and 5094, demonstrated elevated levels of pectolytic enzyme synthesis on a medium with pH 5.0.

It was observed that a high growth rate on pectin-based media does not necessarily correlate with an increased level of pectolytic enzyme synthesis. For *T. versicolor*, no clear relationship between growth rate and pectinase activity was detected. In contrast, *T. ochracea* exhibited moderate correlations between pectinase activity and radial growth rate: a positive correlation in medium with pH 7.0 and a negative correlation in medium with pH 5.0.

These findings suggest that optimizing culture conditions, such as pH, could enhance the potential of *Trametes* species for pectinase production. Further research should focus on investigating the growth and synthesis of pectolytic enzymes in submerged culture using *T. versicolor* 5094, which demonstrated both a high growth rate and significant pectinase synthesis.

Author's contribution

ZRP planning, conducting experiments, data analysis, writing the original; KIR planning, management, writing-reviewing, editing. All authors participated in revising the manuscript and approved the submitted version.

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Conflict of interest

The authors declare no conflict of interest.

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ОЦІНЮВАННЯ ПЕКТИНОЛІТИЧНОЇ АКТИВНОСТІ ТА РОСТУ ШТАМІВ ВИДІВ *Trametes versicolor* ТА *Trametes ochracea* НА ПЕКТИНВМІСНИХ АГАРИЗОВАНИХ СЕРЕДОВИЩАХ

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Дослідження росту базидієвих макроміцетів на пектинвмісних агаризованих середовищах та синтезу пектолітичних ферментів є важливим фактором для відбору перспективних штамів.

Мета. Визначення росту та ферментативної активності базидієвих макроміцетів роду *Trametes* у поверхневій культурі на агаризованих середовищах з пектином.

Методи. Оцінено швидкість радіального росту штамів *T. ochracea* та *T. versicolor* на пептоно-дріжджовому агаризованому середовищі з пектином (ППДА) та глюкозою (ГПДА) з вихідними значеннями pH 5,0 та 7,0. Активність пектинази визначали напівкількісним методом, використовуючи розчин цетилметиламоній броміду, і розраховували індекс пектиназної активності (PAI).

Результати та обговорення. Серед штамів *T. ochracea,* які культивували на ППДА з pH 5,0, найкращий ріст спостерігали у штаму 5302 (7,56 ± 0,41 мм/добу). На ППДА з pH 7,0 найкращий ріст зафіксовано у штаму *T. ochracea* 1561 (6,63 ± 0,29 мм/добу), тоді як штам *T. ochracea* 5300 продемонстрував найменшу швидкість росту за обох значень pH. Для *T. versicolor* на середовищі ППДА з pH 5 найкращі результати швидкості росту продемонстрували штами 353, 1589 та 5095 (9,97 ± 0,44 мм/добу). При pH 7,0 найвища швидкість росту спостерігалася у *T. versicolor* 353 (11,67 ± 0,47 мм/добу). Максимальні значення індексу пектиназної активності серед штамів *T. ochracea* спостерігались у штамів 1561 та 1570 (0,85–1,05), а для *T. versicolor* — у штаму 5094 (1,07 ± 0,04). Встановлено, що швидкість росту на пектинових середовищах не завжди корелює з рівнем синтезу пектолітичних ферментів: для *T. versicolor* чітких залежностей не виявлено, тоді як *T. ochracea* демонструє помірні негативні кореляції (на середовищі з pH 5,0) та позитивні кореляції (на середовищі з pH 7,0) між пектиназною активністю та швидкістю радіального росту.

Висновки. Серед штамів *T. ochracea*, штам 5302 продемонстрував найвищу швидкість росту при pH 5,0, а штам 1561 — при pH 7,0. У штамів *T. versicolor* більшість, за винятком штаму 5161, мала вищі темпи росту на обох рівнях pH, особливо штами 353, 1689, та 5095. Штам 5094 *T. versicolor* проявив найвищу пектиназну активність при pH 7,0. Встановлено, що високий темп росту не завжди корелює з рівнем синтезу пектолітичних ферментів, що відкриває перспективи оптимізації умов культивування, зокрема pH, для підвищення пектиназної активності *Trametes*.

Ключові слова: макроміцети, *Trametes*, пектин, швидкість росту, пектолітичні ферменти, ферментативна активність.