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Lactobacteria for fermentation of vegetable raw materials

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Abstract. The research relevance is determined by the need to select bacterial cultures capable of ensuring a stable and intensive course of plant biomass fermentation. A substantial criterion for the effectiveness of such cultures is their natural ecological adaptation to the substrate, which determines metabolic activity, tolerance to chemical components, and the ability to maintain key quality parameters of preservation. The study aimed to evaluate the morphological, physiological-biochemical, and fermentation properties of three lactic acid bacteria species isolated from different types of plant raw materials, as well as to determine their ability to grow and utilise carbohydrates in alfalfa juice, sugar beet tops juice, and their mixtures supplemented with sweet corn juice. The study was based on species identification methods based on determination of the fermentation profile, assessment of morphology, evaluation of growth characteristics under different temperature regimes, determination of the level of reducing sugar utilisation, and analysis of the dynamics of changes in substrate acidity during fermentation. The study established that isolates from plant raw materials exhibit a high adaptive capacity, manifested in an increase in cell numbers and active carbohydrate utilisation. The most intensive growth of heterofermentative cultures was observed in alfalfa juice and in the alfalfa-corn mixture, where their counts reached 8.68-8.77 log CFU/mL. Sugar beet tops supported enhanced sugar utilisation and pronounced changes in acidity but were less favourable for certain species. The addition of sweet corn juice improved the fermentation properties of all strains. The practical significance of the study is determined by identification of promising bacterial isolates suitable for the development of inoculants aimed at improving the fermentation of plant biomass, in particular for silage and haylage preservation

Keywords: alfalfa juice; sugar beet tops juice; bacterial isolates; carbohydrate substrate; acidity; metabolic activity

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INTRODUCTION

The research relevance is determined by the need to select bacterial cultures capable of ensuring stable and intensive fermentation of plant biomass based on natural ecological adaptation to the substrate. Analysis of morphological, physiological-biochemical, and fermentation properties of lactic acid bacteria isolated from raw plant materials is necessary for development of efficient bacterial inoculants for silage and haylage production. S. Cheas *et al*. (2025) and B. Sionek *et al*. (2023) noted that only lactic acid fermentation can ensure a rapid decrease in environmental pH to levels, unuitable for most undesirable microorganisms. Complex carbohydrates, proteins, and vitamins are preserved without significant losses under such conditions, improving quality of feed. Therefore, silage starter preparations should include lactic acid bacteria cultures in combination with other microorganisms and enzymatic components that improve lactic acid fermentation while suppressing development of putrefactive, butyric acid-producing, yeast, and mold microflora.

The main advantages of lactic acid fermentation during silage preservation are the key role in maintaining the nutritional value of feed and stabilising fermentation processes. A. Fabiszewska *et al*. (2025) and C.O. Okoye *et al*. (2023) proved that lactic acid, formed by fermentation, is a substantial metabolic precursor in animal nutrition and, at the same time, an effective natural preservative. Accumulation of lactic acid suppresses undesirable degradation processes in the ensiled mass, particularly proteolysis, thereby contributing to improved preservation of protein compounds. The criteria for selecting lactic acid bacteria for use in silage and haylage additives are based on their ability to grow rapidly and dominate over the spontaneous microflora, efficiently produce lactic acid, tolerate acidic conditions, and ferment a broad range of carbohydrates. M.F. Akhtar *et al*. (2025) demonstrated that a range of *Lactobacillus plantarum* strains meet these requirements, which accounts for their widespread use in biological preparations for silage production. At the same time, given the limited activity of lactobacilli at the initial stages of fermentation under relatively high pH values, starter cultures are usually formulated as multicomponent compositions with the inclusion of species active under less acidic conditions.

Lactobacillus buchneri is notable among bacterial cultures used in modern silage. The use of this species was recommended by Y. Jin *et al*. (2024) and X. Lai *et al*. (2025) due to increased aerobic stability of silage, manifested by reduced activity of yeasts and molds after the feed comes into contact with oxygen. This positive effect is determined by the formation of acetic acid, which exerts an inhibitory action on microorganisms responsible for silage heating. As a result, silage masses treated by *Lactobacillus buchneri* have lower yeast and mold counts, slower development of microflora after air exposure, and a stable temperature that does not exceed ambient temperature even under warm weather conditions

C. Aslan & A.G. Filik (2025) noted the high tolerance of *Lactobacillus brevis* to acidic conditions and the presence of plant-derived inhibitors, including phenolic compounds, which is relevant for the ensiling of legumes, sugar beet tops, and grass mixtures. Metabolic plasticity of *Lactobacillus brevis* ensures efficient utilisation of both hexoses and pentoses of plant origin, providing stable fermentation even when readily available sugars are limited. M.P. Sychevskyi (2016) proved that in silage practice, *L. brevis* can be used as part of multicomponent bacterial inoculants in combination with homofermentative species. Such formulations combine a rapid decrease in acidity at the initial stages of fermentation with improved aerobic stability of the finished silage, thereby promoting nutrient preservation and enhancing feed quality. The study aimed to isolate and identify lactic acid bacteria from silage and haylage, evaluate their physiological-biochemical and growth characteristics and determine their fermentation activity and adaptability to plant substrates.

MATERIALS AND METHODS

Isolation and identification of lactic acid bacteria. The study was conducted in the Department of Biotechnology of the Institute of Food Resources of the National Academy of Sciences in 2022-2024. Isolates were obtained from fermented green biomass; specifically, corn silage and rye haylage were prepared under laboratory conditions. Fresh green corn intended for silage was chopped to a particle size of 1-2 cm using a knife chopper. The prepared biomass was tightly packed into laboratory polyethylene bags, from which air was removed by vacuuming, after which the bags were hermetically sealed using a heat sealer. The hermetically sealed samples were stored at 20-25°C for 120 days. To isolate lactic acid bacteria (LAB), 20 g samples were collected under aseptic conditions, homogenised in a porcelain mortar with sterile sand, and diluted in 180 cm^3 of sterile physiological saline. Pure cultures were obtained by plating serial dilutions using the pour plate method on MRS agar (De Man *et al.*, 1960). Incubation was conducted at 37°C for 48 hours.

Investigation of morphological, cultural, and physiological properties of the cultures. Pure cultures were maintained in MRS broth at a temperature of (37 ± 2)°C. Phenotypic identification of the strains was performed using generally accepted morphological and physiological-biochemical tests. The physiological-biochemical properties of the strains were assessed by following parameters: amylase, catalase, and oxidase activities; reduction of nitrates to nitrites; ability to produce ammonia from arginine; tolerance to NaCl (5, 6.5, and 10%); tolerance to alkaline reaction of the medium (pH 3.0, 6.5, and 8.0); and growth in MRS at temperatures of 15 and 45°C. Morphological homogeneity of the cultures was monitored by microscopy with Gram staining (Beveridge, 2001). Microscopic analysis was performed using a Motic (Fischer Bioblock) microscope equipped with a built-in TopView video camera at a magnification of ×1000.

The biochemical profiles of the strains were investigated following (De Vos *et al.*, 2011) and using API 50 CHL test systems (bioMérieux, France). Culture identification was performed using apiweb™ software based on the obtained analytical index of the biochemical profile; the results were also recorded, and species designation was confirmed using ABIS online (n.d.). Changes in the main growth parameters in plant substrates were assessed as follows: biomass increase by plating serial dilutions, pH by potentiometric measurement, and reducing sugars by the ferricyanide method, according to (Mateles, 1960). Four types of juices were used for fermentation studies:

1. Alfalfa juice (*Medicago sativa*) (D1) – obtained by mechanical pressing of fresh green biomass.

2. Sugar beet tops juice (leaf biomass of *Beta vulgaris*) (D2) – obtained by mechanical pressing of fresh green biomass.

3. Mixture of alfalfa juice and sweet corn juice at a ratio of 9:1 (v/v) (D3).

4. Mixture of sugar beet tops juice and sweet corn juice at a ratio of 9:1 (v/v) (D4).

The juices were prefiltered through gauze and sterilised by autoclaving at 121°C for 10 minutes (to eliminate background microflora and stabilise the substrate). A 10% inoculum of the tested lactic acid bacteria was added to the prepared juices. Incubation was conducted at 34°C for 14 hours. To confirm LAB viability and growth, control plating on MRS agar was performed.

Statistical analysis. All experiments were performed in three independent replicates. Data were presented as the mean ± standard deviation (SD). Statistical significance of differences between mean values was determined by Duncan's test at a significance level of $p < 0.05$. Experimental studies on plants, including the collection of plant material, were conducted following institutional and national guidelines. The standards of the Convention on Biological Diversity (1992) were maintained.

RESULTS AND DISCUSSION

Studies by S. Danylenko *et al.* (2023) indicated that most effective bacterial isolates capable of improving fermentation processes predominantly originate from the same type of plant raw material or feed for which they are intended to be applied. This is associated with a high level of ecological adaptability of microorganisms: isolates that naturally occur in a substrate are better adapted to chemical composition, buffering capacity, concentration of phenolic compounds, and the spectrum of available carbohydrates of origin. As a result, bacterial isolates exhibit higher growth rates, enhanced organic acid production, and more stable development during fermentation. The study proved that isolates obtained from a specific type of feed raw material are among the most promising candidates for development of highly effective bacterial inoculants, as they combine natural adaptation with stable functional activity under conditions that are as close as possible to those of agrotechnological practice. Within the framework of the study, silage and haylage samples were used as sources of natural populations of lactic acid bacteria capable of ensuring an intensive fermentation of plant biomass. Analysis of the samples revealed the presence of heterogeneous microbial communities dominated by representatives typical of ensiled feeds, belonging to the genera *Lactiplantibacillus*, *Lentilactobacillus*, and *Levilactobacillus*.

To obtain pure isolates, colonies exhibiting morphological characteristics typical of lactic acid bacteria were selected. Identification of the isolated lactic acid bacteria was conducted on the species level using commercial API 50 CH / API 50 CHL system (bioMérieux) and online ABIS system, which ensured high reliability in determination of the species status of the isolates. The results were presented in Table 1 and Table 2. Table 1 demonstrates the morphological and physiological-biochemical properties of the three isolated strains. The sources of isolation of the studied lactic acid bacteria included corn silage and rye haylage. These bacteria are Gram-positive straight or slightly curved rods, existing in single or short chains, occasionally in clusters. Isolate 1 has a homofermentative type of lactic acid fermentation without gas production from glucose, whereas Isolates 2 and 3 are heterofermentative.

Table 1. Morphological and physiological characteristics of lactic acid bacteria

Characteristics	Isolate 1	Isolate 2	Isolate 3
Source of Isolation	Corn silage	Rye haylage	Corn silage
Morphology	Straight or slightly curved rods, 1-3.5 µm long, 0.5-1.0 µm wide; occurring singly or in short chains	Straight or slightly curved rods, 2.0-5.0 µm long, 0.8-1.5 µm wide; occurring singly or in short chains of 3-15 cells	Short or medium-thick rods, 1.0-5.0 µm long, 0.8-1.2 µm wide; occurring singly, in short chains, or small clusters
Gram staining	+	+	+
Gas production from glucose	–	+	+
Catalase	–	–	–
Motility	–	–	–
Oxidase	–	–	–
Nitrate reduction	+	–	–
Gelatin hydrolysis	–	–	–
Growth at temperature			
15°C	+	+	+
45°C	–	–	–
Growth at pH			
3.0	±	–	–
6.5	+	+	+
8.0	+	+	+
Growth with NaCl, %			
5.0	+	+	+
6.5	+	+	+
10	+	–	–

Notes: "+" – positive; "–" – negative; "±" – weakly positive
Source: developed by the authors

Absence of catalase and motility was noted among all isolates; Isolate 1 reduces nitrates to nitrites. All species grow at 15°C and stop at at 45°C. Isolate 1 can grow at pH 3.0, whereas the other two do not. All three species grow efficiently at pH 6.5 and 8.0. *L. plantarum* tolerates up to 10% NaCl.

Table 2. Carbohydrate fermentation characteristics of lactic acid bacteria strains

Carbohydrate fermentation	Isolate 1	Isolate 2	Isolate 3
D-arabinose	–	–	–
D-xylose	–	+	+
Galactose	+	±	–
Gluconate	±	+	+
Glucose	+	+	+
Glycerol	–	–	–
Inulin	–	–	–
Lactose	+	+	–
Maltose	+	+	+
Mannitol	+	+	–
Mannose	+	–	–
Melezitose	+	+	–
Melibiose	+	+	+
Rhamnose	–	–	–
Raffinose	±	–	±
Ribose	+	+	+
Sucrose	+	–	±
Sorbitol	+	–	–
Trehalose	+	–	–
Fructose	+	+	+
Cellobiose	+	–	–

Notes: "+" – positive; "–" – negative; "±" – weakly positive
Source: developed by the authors

Table 2 shows the ability of the three isolates to ferment various carbohydrates. The isolates differed significantly in their carbohydrate fermentation profiles, as Isolate 1 exhibited broadest profile, typical of *Lactiplantibacillus plantarum*; Isolate 2 showed a moderately broad profile, characteristic of *Lentilactobacillus buchneri*; whereas Isolate 3 displayed the narrowest fermentation spectrum, corresponding to the species traits of *Levilactobacillus brevis*. At the next stage of the study, the optimal cultivation temperature for the LAB strains was determined. The effect of cultivation temperature (25-40°C) on the cell counts of the three studied bacterial cultures is shown in Figure 1. The results are expressed as Log 10 CFU/mL for assessment of microbial growth intensity under different temperature regimes.

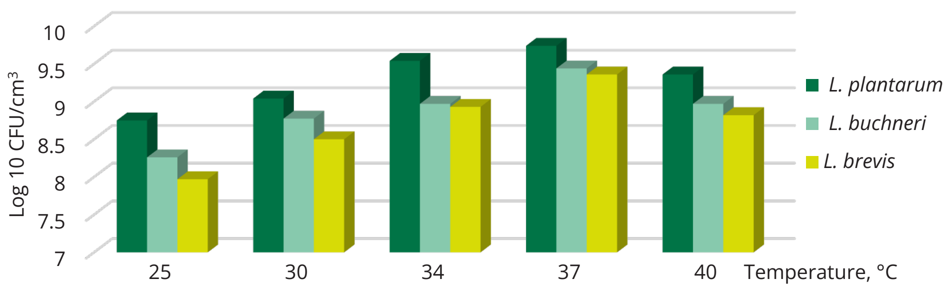

Figure 1. Effect of cultivation temperature on the cell counts of the studied lactic acid bacteria
Source: developed by the authors

Highest growth rates were observed at 34-37°C, correlating to optimal conditions for most mesophilic lactic acid bacteria. At 30°C, relatively high growth was noted, although lower than the maximum, whereas 25°C provided the minimal growth among the tested temperature conditions. Increase in temperature to 40°C provided a moderate decrease in activity, which could be determined by heat-induced stress. All subsequent experiments were conducted at 34°C. Comparison of viable cell counts in juices D1-D4 demonstrates different levels of strain adaptation to the chemical composition of the substrates and the intensity of their growth (Fig. 2).

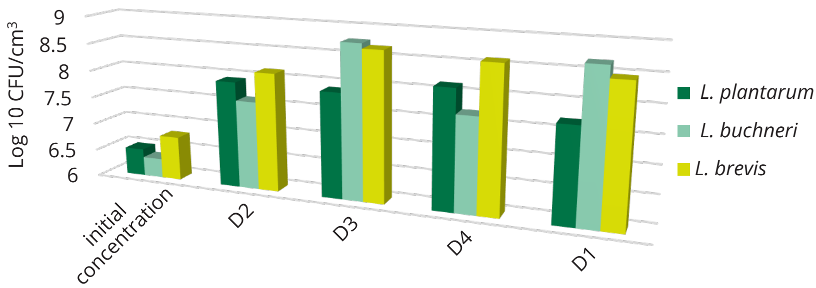

Figure 2. Cell counts of the studied lactic acid bacteria in different plant juices
Source: developed by the authors

The study established that juices D1 and D2 were the most favourable media for the growth of the heterofermentative lactic acid bacteria *Lentilactobacillus buchneri* and *Levilactobacillus brevis*. In these variants, cell counts reached 8.68-8.77 log CFU/mL, indicating a high level of adaptation and intensive metabolism of these species in protein-carbohydrate substrates. *Lactiplantibacillus plantarum* exhibited stable growth in all tested juices (7.7-8.14 log CFU/mL), although at slightly lower levels compared to the heterofermentative species, which may be related to the characteristics of the carbohydrate composition of the plant juices and the high buffering capacity of the substrates.

D2 Juice provided a less optimal enrivonment for *L. buchneri* (7.6-7.7 log CFU/mL), whereas *L. brevis* maintained high cell counts (8.14-8.60 log CFU/mL), indicating higher tolerance of this species to specific components of D2 juice. The addition of 10% sweet corn juice to alfalfa or sugar beet tops juice improved growth of all studied LAB, confirming the feasibility of carbohydrate-enriched mixtures for optimisation of the fermentation of plant raw materials. The obtained results indicate the potential of juices D1 and D2, either standalone or in combination with juices D3 and D4, as substrates for the cultivation and application of formulations based on *L. plantarum*, *L. buchneri*, and *L. brevis* in silage production and plant biomass biopreservation technologies. Figure 3 shows the changes in pH in various plant juices under the influence of the investigated bacterial cultures.

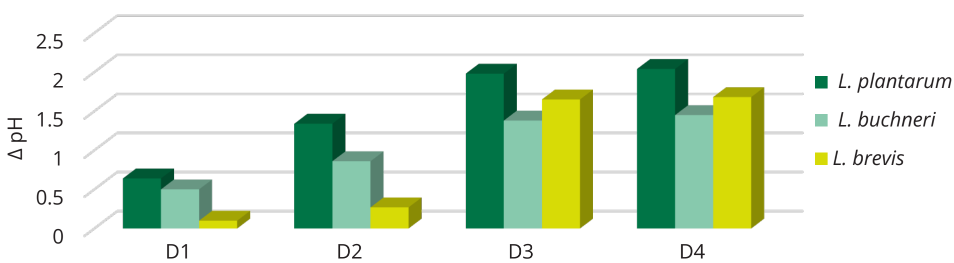

Figure 3. Changes in pH in different plant juices under the influence of the studied bacterial cultures
Source: developed by the authors

Following Figure 3, the ΔpH values demonstrate significant differences between substrates and LAB species. The smallest change in acidity was noted in D1 (ΔpH 0.10-0.64), indicating low lactic acid fermentation intensity. In contrast, D2 juice demonstrated highest pH decrease (ΔpH 1.34-1.98), and the addition of 10% sweet corn juice further increased acidification (up to ΔpH 2.04 for *L. plantarum*). The homofermentative *L. plantarum* consistently demonstrated highest pH reduction capacity, whereas the heterofermentative *L. buchneri* produced the lowest ΔpH values, which corresponds to metabolic profile. *L. brevis* exhibited high activity in D2 and D4 but low activity in D1 juice. Figure 4 demonstrates initial concentration of sugar reduction in the plant juices, as well as the amounts of sugars consumed by individual lactic acid bacteria strains (*L. brevis*, *L. plantarum*, *L. buchneri*) during fermentation after 24 hours. The difference between the initial sugar levels in the juices and the values for each species reflects the metabolic activity of the strain, hence, ability to utilise available plant-derived hexoses and pentoses.

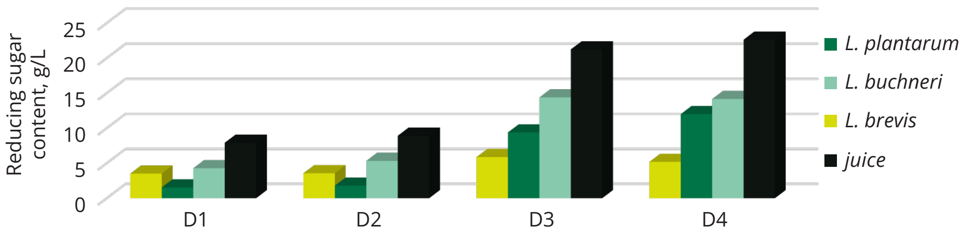

Figure 4. Consumption of reducing sugars by different strains in plant juices
Source: developed by the authors

Analysis of carbohydrate consumption by LAB strains in D1 juice demonstrated that *L. brevis* consumed 3.52-3.56 units, utilising approximately half of the available sugars. *L. plantarum* assimilated only 1.54-1.79 units, which indicates a limited amount of substrate for the homofermentative pathway. *L. buchneri* consumed the largest amount, 4.28-5.33 units, which corresponds to ability to convert residual sugars into acetic acid. D2 Juice improved initial concentration of reducing sugars threefold, demonstrating much more intensive course of lactic acid fermentation. Due to high initial sugar content of this juice, higher carbohydrate consumption was noted among all strains, namely *L. brevis*: 5.18-5.86 units, *L. plantarum*: 9.39-12.00 units, and the highest consumption by *L. buchneri*: 14.16-14.39 units. All strains utilised more than half of the available sugars, with *L. buchneri* consuming up to 65-67%, which is characteristic of heterofermentative metabolism under conditions of sufficient substrate.

The conducted studies demonstrated that lactic acid bacteria isolated from silage and haylage exhibit a high degree of adaptation to plant raw materials, manifested by stable growth, active carbohydrate utilisation, and intensive fermentation processes. The isolated strains, identified as *Lactiplantibacillus plantarum*, *Lentilactobacillus buchneri*, and *Levilactobacillus brevis*, differed in their metabolic profiles and type of lactic acid fermentation. The heterofermentative strains showed the highest cell counts in alfalfa juice and its mixtures with sweet corn juice, whereas *L. plantarum* produced the most pronounced pH reduction. Beet top juice promoted active consumption of reducing sugars and significant changes in acidity, especially for *L. buchneri*, and the addition of 10% sweet corn juice enhanced the growth and fermentation activity of all strains. The obtained results confirm the potential of ecologically adapted isolates for the development of effective bacterial formulations aimed at optimising silaging and bioconservation of plant biomass.

Sugar beet tops juice provides optimal conditions for development of studied lactobacilli. *L. buchneri* strain consistently consumed the largest amount of carbohydrates in all media, highlighting the key role in acetic acid formation in silage, while *L. plantarum* demonstrated highest adaptability in media with high hexose concentrations. The obtained results are consistent with the data of P. McDonald *et al*. (1991) on the influence of the chemical composition of plant substrates on the growth and fermentation activity of lactic acid bacteria. The high cell counts of *L. buchneri* and *L. brevis* during fermentation of juices D1 and

D3 can be attributed to the combination of available carbohydrates and a substantial content of nitrogenous compounds and mineral components, which create favourable conditions for heterofermentative metabolism. Similar trends were reported by N.A. Khan *et al*. (2016) for alfalfa silage and grass mixtures, where the addition of carbohydrate components (corn, cereals) improves LAB growth and fermentation stability.

High values of log CFU/mL for *L. buchneri* and *L. brevis* in the D3 juice mixture are consistent with reports S.J.W.H. Oude Elferink *et al*. (2001) and Z.G. Weinberg & Y. Chen (2013) that heterofermentative LAB, particularly *L. buchneri*, efficiently colonise substrates rich in fermentable sugars and can convert lactic acid into acetic acid and 1,2-propanediol, thereby improving aerobic stability of silage. Therefore, such juice mixtures can be used as model systems for selection of strains with high silage application potential. D2 juice proved to be a less favourable medium for *L. buchneri*, which may be related to specific features of its carbohydrate–mineral profile, the presence of phenolic compounds, or increased buffering capacity that inhibit the growth of certain LAB. At the same time, *L. brevis* was consistent in high performance across all variants, correlating with literature data by K. Suzuki *et al.* (2006) on ability to grow in a wide range of plant substrates, including brewing wort, fermented vegetables, and plant extracts. Such tolerance renders *L. brevis* a promising component of multistrain compositions for biopreservation. Compared to heterofermentative species, *L. plantarum* exhibited slightly lower cell counts, although growth remained high in all media (above 7.7 log CFU/mL). This is consistent with the concept of A.S. Oliveira *et al*. (2017) that *L. plantarum*, as a universal homofermentative species, can efficiently lower pH and provide effective preservation, but does not always reach maximum biomass under conditions of high buffering capacity and relatively low levels of easily fermentable sugars. J.M. Wilkinson & D.R. Davies (2013) noted that the combination of *L. plantarum* with *L. buchneri* and *L. brevis* can be used for both rapid acidification of the substrate and improved aerobic stability due to the production of acetic acid by heterofermentative strains.

A substantial practical aspect is the positive effect of sweet corn juice on alfalfa and sugar beet tops juices. Enrichment of the substrate with readily available carbohydrates improved cell counts of all studied LAB, confirming the feasibility of combined protein- and carbohydrate-rich feed components during ensiling, including crops with high buffering capacity (alfalfa, sugar beet tops). These results are consistent with reports by R.E. Muck *et al*. (2018) on efficiency of carbohydrate additives and bacterial inoculants in improvement of silage fermentation quality and reduction of dry matter losses. Overall, the obtained data confirm that selection of lactic acid bacteria strains should incorporate not only overall fermentative activity but also specific adaptation to particular plant substrates. Alfalfa and sugar beet tops juices, especially when combined with sweet corn juice, can be considered a promising media for the cultivation and application of LAB consortia aimed at improving the efficiency of ensiling and the bioconservation of plant biomass. The obtained results can be used for the development of effective inoculants for the fermentation of plant biomass, particularly for the ensiling of legumes and sugar beet residues.

CONCLUSIONS

As a result of the conducted studies, three lactic acid bacterial isolates were isolated and identified from corn silage and rye haylage, namely *Lactiplantibacillus plantarum*, *Lentilactobacillus buchneri*, and *Levilactobacillus brevis* species. These isolates differed in lactic acid fermentation type and carbohydrate fermentation profiles. Optimal cultivation temperature for all investigated strains, at which the maximum cell counts were observed, was 34-37°C whereas minimal growth was recorded at 25°C, and an increase in temperature to 40°C resulted in a moderate decrease in metabolic activity. Highest growth levels of the heterofermentative strains *L. buchneri* and *L. brevis* were noted to be in alfalfa juice and alfalfa-corn mixtures, with cell counts reaching 8.68-8.77 log CFU/mL, indicating a high level of adaptation to protein-carbohydrate substrates. The homofermentative strain *Lactiplantibacillus plantarum* demonstrated stable growth in all tested juices, with cell counts of 7.7-8.14 log CFU/mL, and highest lactic acid production capacity, resulting in a pH decrease of ΔpH 1.98-2.04 in carbohydrate-enriched media.

Beet top juice exhibited the highest initial concentration of reducing sugars and supported their intensive consumption by all strains; *L. buchneri* utilised 65-67% of the available carbohydrates, which was consistent with its heterofermentative metabolic profile. The addition of 10% corn juice to alfalfa or beet top juices promoted increased cell counts of all investigated LAB, intensified the consumption of reducing sugars, and enhanced medium acidification compared with single-component substrates. The obtained results can be used as a scientific basis for the development and production of domestic bacterial inoculants based on highly efficient lactic acid bacteria adapted to plant raw materials, which can optimise the silaging and bioconservation processes.

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CONFLICT OF INTEREST

None.

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Лактобактерії для ферментації рослинної сировини

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Анотація. Актуальність даного дослідження зумовлена необхідністю відбору бактеріальних культур, здатних забезпечувати стабільний та інтенсивний перебіг ферментації рослинної біомаси. Важливим критерієм ефективності таких культур є їх природна екологічна адаптація до субстрату, що визначає метаболічну активність, толерантність до хімічних компонентів та здатність підтримувати ключові показники якості консервування. Метою цього дослідження було оцінити морфологічні, фізіолого-біохімічні та ферментаційні властивості трьох видів молочнокислих бактерій, ізольованих із різних типів рослинної сировини, а також визначити їхню здатність до росту й утилізації вуглеводів у соку люцерни, соку гички цукрового буряка та їх сумішах із додаванням соку солодкої кукурудзи. У роботі застосовувалися методи видової ідентифікації, засновані на визначенні ферментаційного профілю, оцінці морфологічних ознак, дослідженні ростових характеристик за різних температурних режимів, встановленні рівня споживання відновлювальних цукрів та аналізі динаміки змін кислотності субстрату під час ферментації. Було встановлено, що ізоляти, отримані з рослинної сировини, характеризуються високою адаптивною здатністю, що проявлялося у збільшенні кількості клітин та активному використанні вуглеводів. Найінтенсивніший ріст гетероферментативних культур спостерігався у соку люцерни та в суміші люцерни з кукурудзою, де їх чисельність досягала 8,68-8,77 log КУО/мл. Гичка цукрового буряка сприяла посиленому споживанню цукрів і вираженим змінам кислотності, однак була менш сприятливою для окремих видів. Додавання соку солодкої кукурудзи покращувало ферментаційні властивості всіх досліджуваних штамів. Практичне значення роботи полягає у виявленні перспективних бактеріальних ізолятів, придатних для розроблення інокулянтів, спрямованих на підвищення ефективності ферментації рослинної біомаси, зокрема при консервуванні силосу та сінажу

Ключові слова: сік люцерни; сік гички цукрового буряка; бактеріальні ізоляти; вуглеводний субстрат; кислотність; метаболічна активність