Isolation and screening of yeast for single cell protein production

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Abstract—**Single cell protein (SCP) has emerged as a promising alternative source of protein to meet the increasing global demand for food and feed supplements. Yeasts are among the most widely utilized microorganisms for SCP production due to their rapid growth rate, high protein content, ability to utilize diverse substrates, and Generally Recognized as Safe (GRAS) status. The present study focuses on the isolation and screening of yeast strains for efficient single cell protein production. Samples were collected from various natural sources such as fruits, fermented foods, and soil, followed by serial dilution and cultivation on selective yeast media. Distinct yeast colonies were isolated based on morphological characteristics and purified through repeated streaking techniques. Preliminary identification was carried out using microscopic observation and biochemical tests. The isolated strains were screened for biomass production, growth rate, substrate utilization efficiency, and protein content under controlled laboratory conditions. Quantitative estimation of protein was performed using standard analytical methods, and the most promising isolates were selected based on their superior biomass yield and protein accumulation. The results demonstrated considerable variation among the isolates, with certain strains exhibiting high growth performance and elevated protein content, indicating their potential for SCP production. Optimization of culture conditions further enhanced biomass productivity and nutritional quality. The study highlights the importance of exploring naturally occurring yeast populations as sustainable sources of microbial protein. The selected yeast isolates may serve as suitable candidates for large-scale SCP production using inexpensive substrates, contributing to food security, waste valorization, and environmentally friendly protein generation. These findings provide a foundation for further research on strain improvement and industrial application of yeast-based single cell protein production technologies.**

Index Terms—**Yeast, single cell proteins, unicellular and multicellular organisms, fungi**

I. INTRODUCTION

Yeasts are unicellular eukaryotic microorganisms belonging primarily to the kingdom Fungi. They are widely distributed in nature and can be found in diverse habitats such as soil, water, plant surfaces, fruits, flowers, and fermented food products. Unlike filamentous fungi, yeasts grow predominantly as single cells and reproduce mainly through budding or fission. Their simple nutritional requirements, rapid growth rate, and adaptability to a wide range of environmental conditions have made them one of the most extensively studied and utilized microorganisms in biotechnology. Among the various yeast species, *Saccharomyces cerevisiae* is the most well-known and has been used for centuries in baking, brewing, and winemaking. Over time, advances in microbiology and industrial biotechnology have expanded the applications of yeast beyond traditional fermentation processes to include enzyme production, pharmaceuticals, biofuels, and single cell protein production [1]. Yeasts possess several biological characteristics that make them highly valuable for industrial applications. They have short generation times and can efficiently convert a variety of organic substrates into cellular biomass. Their ability to metabolize sugars and other carbon sources allows them to grow rapidly under controlled conditions, resulting in high biomass yields within a relatively short period. In addition, yeast cells contain significant amounts of proteins, vitamins, essential amino acids, lipids, and minerals, making them nutritionally rich microorganisms. These properties have attracted considerable interest in utilizing yeast as a sustainable source of microbial protein for both human consumption and animal feed [2].

The growing global population, increasing demand for protein-rich foods, and limited availability of conventional protein sources have created a need for alternative and sustainable protein production systems. Traditional protein sources such as meat, fish, soybean, and dairy products require extensive land, water, and energy resources, making them increasingly challenging to sustain. In this context, microbial protein production has emerged as a promising solution to address future food security challenges. Single cell protein (SCP), which refers to the dried microbial biomass or extracted protein derived from microorganisms, has gained significant attention due to its high nutritional value and efficient production process. Among the microorganisms used for SCP production, yeasts are considered particularly advantageous because of their safety, ease of cultivation, and high protein content. The protein content of yeast biomass generally ranges from 40% to 60% of its dry weight, depending on the species and cultivation conditions [3]. Furthermore, yeast proteins contain a balanced composition of essential amino acids, including lysine, which is often deficient in cereal-based diets. In addition to proteins, yeast biomass serves as a rich source of B-complex vitamins, nucleic acids, dietary fibers, and various micronutrients. These nutritional attributes make yeast-derived SCP an attractive supplement for improving the nutritional quality of food and feed products [4]. Moreover, the production of SCP using yeast can be accomplished using low-cost agricultural residues, industrial by-products, and waste substrates, thereby reducing production costs and contributing to environmental sustainability. Yeast also plays a significant role in environmental management through its ability to utilize organic wastes as growth substrates. Agricultural residues, fruit and vegetable wastes, molasses, whey, and other industrial by-products can be converted into valuable microbial biomass through yeast fermentation. This process not only generates protein-rich biomass but also helps in waste reduction and resource recovery [5].

Consequently, yeast-based SCP production aligns with the principles of circular bioeconomy and sustainable development by transforming waste materials into valuable nutritional products. The utilization of renewable substrates further reduces dependence on conventional agricultural resources and minimizes environmental pollution. The isolation and screening of efficient yeast strains are essential steps in the development of successful SCP production systems. Natural environments harbor a diverse population of yeast species with varying metabolic capabilities and growth characteristics [6]. Isolating yeast strains from different ecological niches such as fruits, flowers, fermented foods, and soil provides opportunities to identify organisms with superior biomass production potential. Screening procedures are employed to evaluate the growth rate, substrate utilization efficiency, stress tolerance, and protein content of isolated strains. The selection of high-performing yeast isolates is crucial for optimizing SCP production and achieving maximum productivity under industrial conditions [7].

Recent advances in microbial biotechnology have further enhanced the potential applications of yeast in protein production. Genetic engineering, strain improvement techniques, and process optimization strategies have enabled researchers to develop yeast strains with increased biomass yield and improved nutritional quality. Modern fermentation technologies allow precise control of environmental factors such as pH, temperature, aeration, and nutrient availability, resulting in enhanced protein accumulation and overall process efficiency. These technological developments have strengthened the role of yeast as a reliable and sustainable source of microbial protein for future food and feed industries. Yeast represents one of the most important microbial resources for biotechnological applications due to its rapid growth, nutritional richness, safety, and versatility [8]. Its significance in single cell protein production has gained considerable attention as the world seeks sustainable alternatives to conventional protein sources. The ability of yeast to convert inexpensive substrates and waste materials into valuable protein-rich biomass makes it an environmentally friendly and economically viable solution for addressing global nutritional challenges. Therefore, the isolation and screening of efficient yeast strains remain essential for advancing SCP technology and promoting sustainable protein production for future generations [9].

II. IMPORTANCE OF YEAST IN RESEARCH

Yeast has played a pivotal role in scientific research for more than a century and continues to be one of the most extensively studied microorganisms in biology and biotechnology. As a simple unicellular eukaryote, yeast possesses many cellular and genetic characteristics that are similar to those of higher organisms, including humans. This unique combination of simplicity and biological relevance makes yeast an ideal model organism for studying fundamental biological processes. Among various yeast species, *Saccharomyces cerevisiae* has become one of the most important experimental systems in molecular biology, genetics, cell biology, and biotechnology [10]. The extensive knowledge gained from yeast research has significantly contributed to our understanding of cellular functions and has led to numerous scientific breakthroughs. One of the primary reasons for the widespread use of yeast in research is its ease of cultivation and rapid growth. Yeast cells can be grown on inexpensive culture media under laboratory conditions and have a short generation time, allowing researchers to obtain results quickly. Large populations of genetically identical cells can be produced within a short period, making experimental studies more efficient and reproducible [11].

Furthermore, yeast can be maintained and manipulated with relatively simple laboratory techniques, making it accessible to researchers across various scientific disciplines. These advantages have established yeast as an indispensable tool for both basic and applied research. Yeast has made significant contributions to the field of genetics. Many of the fundamental principles of inheritance, gene regulation, and chromosome behavior have been investigated using yeast model systems. Because yeast possesses a fully sequenced genome and can exist in both haploid and diploid forms, it provides unique opportunities for genetic analysis. Researchers can easily introduce mutations, delete genes, or insert foreign DNA to study gene function and regulation. These genetic tools have enabled scientists to identify genes involved in various cellular processes and to understand how genetic changes influence cell behavior [12]. The knowledge obtained from yeast genetics has provided valuable insights into the genetic mechanisms operating in more complex organisms. In cell biology research, yeast serves as an excellent model for studying essential cellular processes such as cell division, DNA replication, DNA repair, protein synthesis, intracellular transport, and signal transduction. Many of these processes are highly conserved across eukaryotic organisms, meaning that discoveries made in yeast often apply to plants, animals, and humans. Research using yeast has greatly improved our understanding of the cell cycle, particularly the molecular mechanisms that regulate cell growth and division. Several key proteins involved in cell-cycle control were first identified in yeast, leading to important discoveries in cancer biology and human health [13]. The significance of these contributions is reflected in the awarding of multiple Nobel Prizes for research involving yeast model systems.

Yeast has also become an important tool in biomedical research. Many human diseases are associated with defects in cellular processes that are conserved in yeast. Scientists use yeast models to investigate the molecular basis of diseases such as cancer, neurodegenerative disorders, metabolic diseases, and genetic abnormalities. By introducing disease-related genes into yeast cells, researchers can study their functions and identify potential therapeutic targets.

Yeast-based screening systems are frequently employed in drug discovery programs to evaluate the effects of pharmaceutical compounds on cellular pathways [14]. These studies contribute to the development of new medicines and improve our understanding of disease mechanisms. The importance of yeast extends beyond basic biological research into the field of biotechnology. Yeast is widely used as a host organism for the production of recombinant proteins, enzymes, vaccines, and other valuable bioproducts. Genetic engineering techniques have enabled scientists to modify yeast strains to produce commercially important compounds with high efficiency. For example, yeast has been utilized in the production of insulin, hepatitis vaccines, industrial enzymes, and bioactive molecules. The ability of yeast to perform eukaryotic post-translational modifications makes it particularly valuable for producing proteins that require proper folding and functional activity [15]. Consequently, yeast serves as a bridge between laboratory research and industrial-scale applications. In the field of environmental biotechnology, yeast is used to study waste management, bioremediation, and sustainable resource utilization. Researchers investigate the ability of yeast strains to degrade pollutants, remove heavy metals, and convert agricultural and industrial wastes into useful products. Such studies contribute to the development of environmentally friendly technologies that address global challenges related to pollution and waste disposal. Yeast is also extensively studied for biofuel production, particularly in the fermentation of sugars into ethanol. Advances in yeast research have improved bioethanol production processes and supported the development of renewable energy sources.

Another important area of yeast research is single cell protein (SCP) production. As global concerns regarding food security and sustainable protein sources continue to grow, yeast has emerged as a promising candidate for microbial protein production [16]. Researchers investigate various yeast species to identify strains capable of producing high biomass and protein yields using low-cost substrates. Studies focus on optimizing growth conditions, improving nutritional quality, and enhancing production efficiency. The findings from these investigations contribute to the development of sustainable food and feed resources that can help meet future nutritional demands. Modern advances in genomics, transcriptomics, proteomics, and systems biology have further expanded the significance of yeast in scientific research. High-throughput technologies allow researchers to analyze gene expression patterns, protein interactions, and metabolic pathways on a genome-wide scale. Because yeast is one of the best-characterized eukaryotic organisms, it serves as an ideal platform for testing new experimental methods and computational approaches [17]. The vast amount of genomic and functional data available for yeast continues to facilitate discoveries across multiple fields of science. Yeast remains one of the most valuable organisms in scientific research due to its simplicity, rapid growth, genetic tractability, and similarity to higher eukaryotes. Its contributions to genetics, cell biology, medicine, biotechnology, environmental science, and industrial applications have profoundly influenced modern scientific knowledge. The versatility of yeast as both a model organism and a production platform ensures its continued importance in future research endeavors. As new technologies emerge and global challenges evolve, yeast will undoubtedly continue to play a critical role in advancing scientific understanding and developing innovative solutions for human welfare and sustainable development [18].

III. YEAST SINGLE CELL PROTEINS

Single cell protein (SCP) refers to the protein-rich biomass obtained from microorganisms such as bacteria, fungi, algae, and yeasts that can be used as a nutritional supplement for humans and animals. Among the various microorganisms employed for SCP production, yeasts have gained considerable attention due to their high protein content, rapid growth rate, nutritional value, and ease of cultivation. Yeast-derived single cell protein has emerged as a promising alternative to conventional protein sources in response to the growing global demand for food and feed proteins. The increasing world population, limited agricultural resources, and rising concerns regarding environmental sustainability have intensified the search for efficient and renewable protein sources, making yeast SCP an important area of research and industrial development [19]. Yeasts are unicellular eukaryotic microorganisms capable of converting a wide variety of organic substrates into cellular biomass. Species such as *Saccharomyces cerevisiae*, *Candida utilis*, *Kluyveromyces marxianus*, *Yarrowia lipolytica*, and *Pichia pastoris* are commonly investigated for SCP production because of their ability to grow rapidly and accumulate substantial amounts of protein. The protein content of yeast biomass generally ranges between 40% and 60% of dry cell weight, depending on the species, cultivation conditions, and nutrient availability. In addition to proteins, yeast biomass contains essential amino acids, vitamins, minerals, lipids, carbohydrates, and dietary fibers, making it a highly nutritious food and feed ingredient. One of the most significant advantages of yeast SCP is its favorable amino acid composition. Yeast proteins contain many essential amino acids required for human and animal nutrition, including lysine, threonine, leucine, valine, and phenylalanine [20].

Lysine is particularly important because it is often deficient in cereal-based diets commonly consumed in many parts of the world. The inclusion of yeast SCP in food and feed formulations can therefore improve overall protein quality and nutritional balance. Furthermore, yeast biomass is rich in B-complex vitamins such as thiamine, riboflavin, niacin, folic acid, and biotin, which contribute to various metabolic and physiological functions. The production of yeast SCP involves the cultivation of selected yeast strains under controlled environmental conditions to maximize biomass yield and protein accumulation. The process typically includes substrate preparation, inoculum development, fermentation, biomass harvesting, drying, and product formulation [21]. Yeasts can utilize a wide range of carbon and energy sources, including glucose, sucrose, molasses, whey, fruit wastes, agricultural residues, lignocellulosic hydrolysates, and industrial by-products. This flexibility allows the use of inexpensive and renewable raw materials, significantly reducing production costs. Additionally, the utilization of waste materials contributes to environmental sustainability by minimizing waste accumulation and promoting resource recovery. Fermentation is a critical step in SCP production [22]. During fermentation, yeast cells metabolize available nutrients and convert them into cellular biomass through various biochemical pathways. Factors such as temperature, pH, aeration, agitation, nutrient concentration, and incubation time significantly influence yeast growth and protein production. Optimization of these parameters is essential to achieve maximum biomass yield and high protein content. Modern fermentation technologies, including batch, fed-batch, and continuous culture systems, have improved the efficiency and scalability of yeast SCP production processes. These advancements have facilitated the commercial production of microbial proteins for various applications [23].

Yeast SCP has numerous applications in both human nutrition and animal feeding. In human food products, yeast biomass can be incorporated into protein supplements, fortified foods, bakery products, nutritional beverages, and health foods. The high nutritional value and functional properties of yeast proteins make them attractive ingredients in the development of alternative protein products. In animal nutrition, yeast SCP is widely used as a protein supplement in poultry, aquaculture, cattle, and pet feeds. Studies have demonstrated that yeast-based feed supplements can improve growth performance, feed efficiency, immune function, and overall animal health. As a result, yeast SCP is increasingly recognized as a sustainable substitute for traditional feed ingredients such as fishmeal and soybean meal. Apart from its nutritional benefits, yeast SCP offers several environmental and economic advantages [24]. Conventional protein production from livestock and crop cultivation requires substantial amounts of land, water, fertilizers, and energy. In contrast, microbial protein production requires significantly fewer natural resources and can be accomplished within a much shorter time frame. Yeast cultures can generate large quantities of biomass in a matter of hours or days, whereas traditional agricultural protein sources often require months or years to produce. This high productivity makes yeast SCP an efficient and sustainable solution for addressing global protein shortages [25]. Furthermore, the use of industrial and agricultural wastes as fermentation substrates supports circular economy principles and reduces environmental pollution. Despite its numerous advantages, certain challenges must be addressed to maximize the utilization of yeast SCP. One major concern is the relatively high nucleic acid content present in yeast biomass. Excessive consumption of nucleic acids may lead to elevated uric acid levels in humans, potentially causing health complications such as gout.

Therefore, processing techniques such as heat treatment, enzymatic degradation, and chemical extraction are often employed to reduce nucleic acid content before human consumption. Researchers are also exploring genetic and metabolic engineering approaches to develop yeast strains with improved nutritional characteristics and lower nucleic acid levels. Recent advances in biotechnology have significantly enhanced the potential of yeast SCP production. Genetic engineering, strain improvement, metabolic pathway optimization, and systems biology approaches have enabled scientists to develop highly productive yeast strains capable of utilizing diverse substrates efficiently [26]. These innovations have improved biomass yield, protein quality, and process economics. Moreover, the integration of modern bioprocess technologies and sustainable feedstock utilization has strengthened the commercial viability of yeast-based protein production systems. Yeast single cell protein represents a promising and sustainable alternative to conventional protein sources. Its high protein content, balanced amino acid profile, rapid production cycle, and ability to utilize low-cost substrates make it an attractive solution to global food and feed challenges. The environmental benefits associated with waste utilization and resource efficiency further enhance its significance in modern biotechnology. Continued research on yeast isolation, screening, strain improvement, and process optimization will contribute to the development of efficient SCP production systems capable of supporting future nutritional needs and promoting sustainable agricultural practices [27].

IV. IMPORTANCE OF YEAST SINGLE CELL PROTEINS IN RESEARCH

Yeast single cell protein (SCP) has become an important area of scientific research due to its potential to provide a sustainable, nutritious, and economically viable alternative to conventional protein sources. Single cell protein refers to the protein-rich biomass derived from microorganisms, particularly yeasts, bacteria, fungi, and algae. Among these microorganisms, yeasts have received significant attention because of their rapid growth, high protein content, nutritional value, safety, and ability to utilize a wide variety of substrates. As global concerns regarding food security, population growth, environmental sustainability, and protein shortages continue to increase, research on yeast SCP has expanded considerably [28]. Scientists around the world are investigating various aspects of yeast SCP production to improve its efficiency, nutritional quality, and commercial feasibility. One of the major reasons for the importance of yeast SCP research is the growing global demand for protein-rich foods and animal feeds. The world population is increasing rapidly, placing immense pressure on existing agricultural systems to meet nutritional requirements. Traditional protein sources such as meat, fish, milk, and soybean products require extensive land, water, energy, and other natural resources. In contrast, yeast SCP can be produced in a relatively short period using controlled fermentation processes and renewable raw materials. Research in this field focuses on developing sustainable methods for producing high-quality protein that can supplement or partially replace conventional protein sources [29]. Such studies are essential for ensuring future food security and reducing dependence on resource-intensive agricultural practices. Research on yeast SCP is also important because it contributes to the understanding and optimization of microbial growth processes. Scientists investigate the physiological and metabolic characteristics of various yeast species to identify strains capable of producing high biomass yields and elevated protein content. Species such as *Saccharomyces cerevisiae*, *Candida utilis*, *Kluyveromyces marxianus*, and *Yarrowia lipolytica* are frequently studied for their protein production potential.

Through laboratory experiments, researchers evaluate growth rates, nutrient utilization patterns, fermentation efficiency, and protein accumulation under different environmental conditions. These studies help identify superior strains that can be used for large-scale SCP production and industrial applications. Another significant area of research involves the utilization of low-cost and renewable substrates for yeast SCP production. Researchers explore the possibility of using agricultural residues, fruit and vegetable wastes, molasses, whey, lignocellulosic biomass, and industrial by-products as fermentation substrates. Such investigations are important because substrate cost represents a major component of SCP production expenses [30]. By identifying inexpensive and readily available feedstocks, researchers can reduce production costs and improve the economic viability of microbial protein production. Additionally, the conversion of waste materials into valuable protein-rich biomass contributes to waste management and environmental sustainability. This aspect of SCP research supports the principles of circular bioeconomy by transforming waste into useful nutritional products. The nutritional quality of yeast SCP is another critical area of scientific investigation [31]. Researchers analyze the protein content, amino acid composition, vitamin levels, mineral content, and digestibility of yeast biomass to assess its suitability for human and animal consumption. Studies have shown that yeast SCP contains a balanced profile of essential amino acids, particularly lysine, which is often limited in cereal-based diets. Research efforts are directed toward improving the nutritional value of SCP through strain selection, genetic modification, and optimization of cultivation conditions. Such studies are essential for developing high-quality protein supplements capable of addressing nutritional deficiencies and supporting healthy growth in both humans and livestock [32].

Yeast SCP research also plays an important role in animal nutrition and aquaculture. The increasing demand for animal-derived products has intensified the need for sustainable feed ingredients. Conventional feed components such as fishmeal and soybean meal are often expensive and associated with environmental concerns. Researchers investigate yeast SCP as an alternative feed protein source for poultry, cattle, pigs, fish, and shrimp. Numerous studies evaluate the effects of yeast biomass on animal growth performance, feed conversion efficiency, immune response, gut health, and disease resistance. The findings contribute to the development of sustainable animal production systems and help reduce the environmental impact of livestock and aquaculture industries [33]. Advances in biotechnology have further increased the importance of yeast SCP research. Modern molecular biology techniques enable scientists to improve yeast strains through genetic engineering and metabolic pathway modification. Researchers can enhance protein synthesis, increase substrate utilization efficiency, and reduce undesirable components such as nucleic acids. Genetic and genomic studies provide valuable insights into the regulatory mechanisms controlling yeast metabolism and biomass production. These technological advancements contribute to the development of highly productive yeast strains capable of meeting industrial demands [34]. Consequently, yeast SCP research serves as an important platform for integrating biotechnology with sustainable food production. Another important contribution of yeast SCP research is its role in environmental protection. Industrialization and population growth have generated large quantities of organic wastes that pose environmental challenges. Researchers study the capacity of yeast to convert these waste materials into useful microbial biomass through fermentation processes. This approach not only produces valuable protein but also reduces waste accumulation and environmental pollution. Studies on waste valorization using yeast SCP contribute to sustainable resource management and support efforts to achieve environmental conservation goals [35].

As a result, yeast SCP research has become increasingly relevant in addressing both nutritional and ecological challenges simultaneously. Research on fermentation technology is also closely linked to yeast SCP production. Scientists investigate various fermentation methods, including batch, fed-batch, and continuous culture systems, to maximize biomass productivity and protein yield. Parameters such as temperature, pH, aeration, agitation, nutrient concentration, and incubation period are optimized to improve process efficiency. These studies contribute to the development of scalable and economically feasible production systems suitable for industrial applications. Improved fermentation technologies enhance the commercial potential of yeast SCP and facilitate its adoption by food and feed industries. In recent years, the importance of yeast SCP research has expanded further due to the growing interest in alternative and sustainable proteins [36]. Consumers are increasingly seeking environmentally friendly food sources with lower ecological footprints. Researchers are therefore exploring innovative applications of yeast-derived proteins in functional foods, meat alternatives, nutritional supplements, and health products. Such investigations support the development of future food systems capable of meeting global nutritional needs while minimizing environmental impact. Research on yeast single cell proteins is of great importance because it addresses critical challenges related to food security, nutrition, sustainability, and environmental protection. Studies on yeast isolation, strain improvement, substrate utilization, fermentation technology, and nutritional enhancement continue to advance the field and expand its practical applications [37]. The ability of yeast to produce high-quality protein from inexpensive and renewable resources makes it a valuable tool for sustainable development. As global demand for protein continues to rise, ongoing research on yeast SCP will play a crucial role in developing innovative solutions for future food and feed production systems.

V. RESULTS

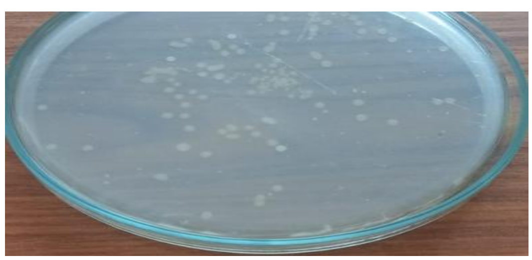

Figure 1: Isolation of yeast on selective medium

Figure 2: Lactophenol cotton blue staining of yeast

Figure 3: Chromatogram revealing the presence on peptides after paper chromatography

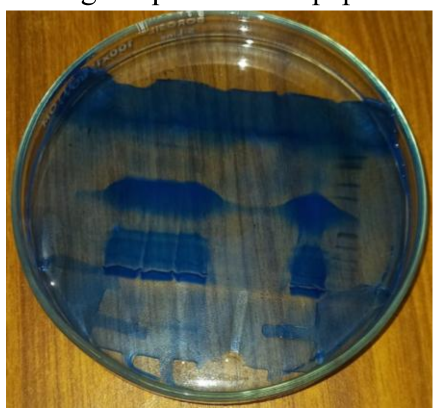

Figure 4: SDS page analysis of proteins isolated from yeast

VI. DISCUSSION

The present study focused on the isolation and screening of yeast strains for their potential application in single cell protein (SCP) production. Yeasts were successfully isolated from natural sources and cultured under laboratory conditions to evaluate their growth characteristics and protein-producing ability. The isolation process revealed the presence of diverse yeast populations, indicating that natural environments such as fruits, fermented foods, and soil serve as rich reservoirs of microorganisms with potential industrial significance. The distinct colony morphology and microscopic characteristics observed among the isolates suggest variability in physiological and metabolic traits, which may influence their suitability for SCP production. Screening of the isolated yeast strains demonstrated considerable differences in growth rate, biomass production, and protein content. Such variation is commonly observed among yeast species due to differences in nutrient utilization efficiency and metabolic capabilities. Some isolates exhibited rapid growth and produced higher biomass yields, indicating their ability to efficiently convert available nutrients into cellular material. Since biomass accumulation is directly related to SCP production, these isolates were considered more promising candidates for further investigation.

The results support previous findings that yeast strains differ significantly in their capacity to produce microbial protein and therefore require careful selection before industrial application. The protein estimation studies indicated that selected isolates contained appreciable amounts of protein, confirming the nutritional potential of yeast biomass. The high protein content observed in certain strains may be attributed to efficient nitrogen assimilation and active cellular metabolism during growth. In addition to protein, yeast biomass is known to contain essential amino acids, vitamins, and minerals, further enhancing its value as a nutritional supplement. The ability of yeast to produce protein-rich biomass within a short cultivation period highlights its potential as a sustainable alternative to conventional protein sources. The study also demonstrated the importance of screening procedures in identifying superior yeast strains for SCP production. Parameters such as colony growth, biomass yield, and protein content proved effective in selecting promising isolates. These findings emphasize that strain selection is a critical step in developing efficient SCP production systems. Furthermore, the use of naturally occurring yeast isolates provides opportunities to discover strains that are well adapted to diverse environmental conditions and capable of utilizing inexpensive substrates. Overall, the results of this study indicate that yeast is a promising microorganism for single cell protein production due to its rapid growth, high biomass yield, and significant protein content. The successful isolation and screening of efficient yeast strains provide a foundation for further optimization studies involving culture conditions, substrate utilization, and large-scale production processes. Future research should focus on strain identification, nutritional profiling, and process optimization to enhance protein yield and support the commercial application of yeast-based SCP production for food and feed industries.

VII. CONCLUSION

The present study on the isolation and screening of yeast for single cell protein (SCP) production demonstrated the potential of naturally occurring yeast strains as valuable sources of microbial protein. Yeast isolates obtained from different natural sources were successfully cultured, purified, and evaluated for their growth characteristics and protein-producing ability. The findings revealed considerable variation among the isolates in terms of biomass production and protein content, highlighting the importance of systematic screening for the selection of efficient strains. The study confirmed that certain yeast isolates possess superior growth performance and the ability to accumulate significant amounts of protein, making them suitable candidates for SCP production. The results further emphasize the significance of yeast as a sustainable and economical alternative to conventional protein sources. Due to their rapid growth rate, high nutritional value, and ability to utilize a wide range of substrates, yeasts offer considerable advantages for large-scale protein production. The selected isolates demonstrated promising potential for converting available nutrients into protein-rich biomass, which can be utilized in food and animal feed applications. Moreover, the possibility of using low-cost agricultural and industrial residues as substrates enhances the economic feasibility and environmental sustainability of yeast-based SCP production. Overall, this study highlights the importance of isolating and screening efficient yeast strains to improve SCP productivity and nutritional quality. The successful identification of promising isolates provides a strong foundation for further research aimed at optimizing culture conditions, enhancing biomass yield, and improving protein content.

Future investigations involving molecular identification, strain improvement, and large-scale fermentation studies may contribute to the commercial development of yeast-derived single cell proteins. Thus, yeast-based SCP production represents a promising strategy for addressing global protein demands while supporting sustainable food and feed production systems

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