Herbicide-Based Selection of Mutants for Improved Single Cell Protein Synthesis: Application and Procedures

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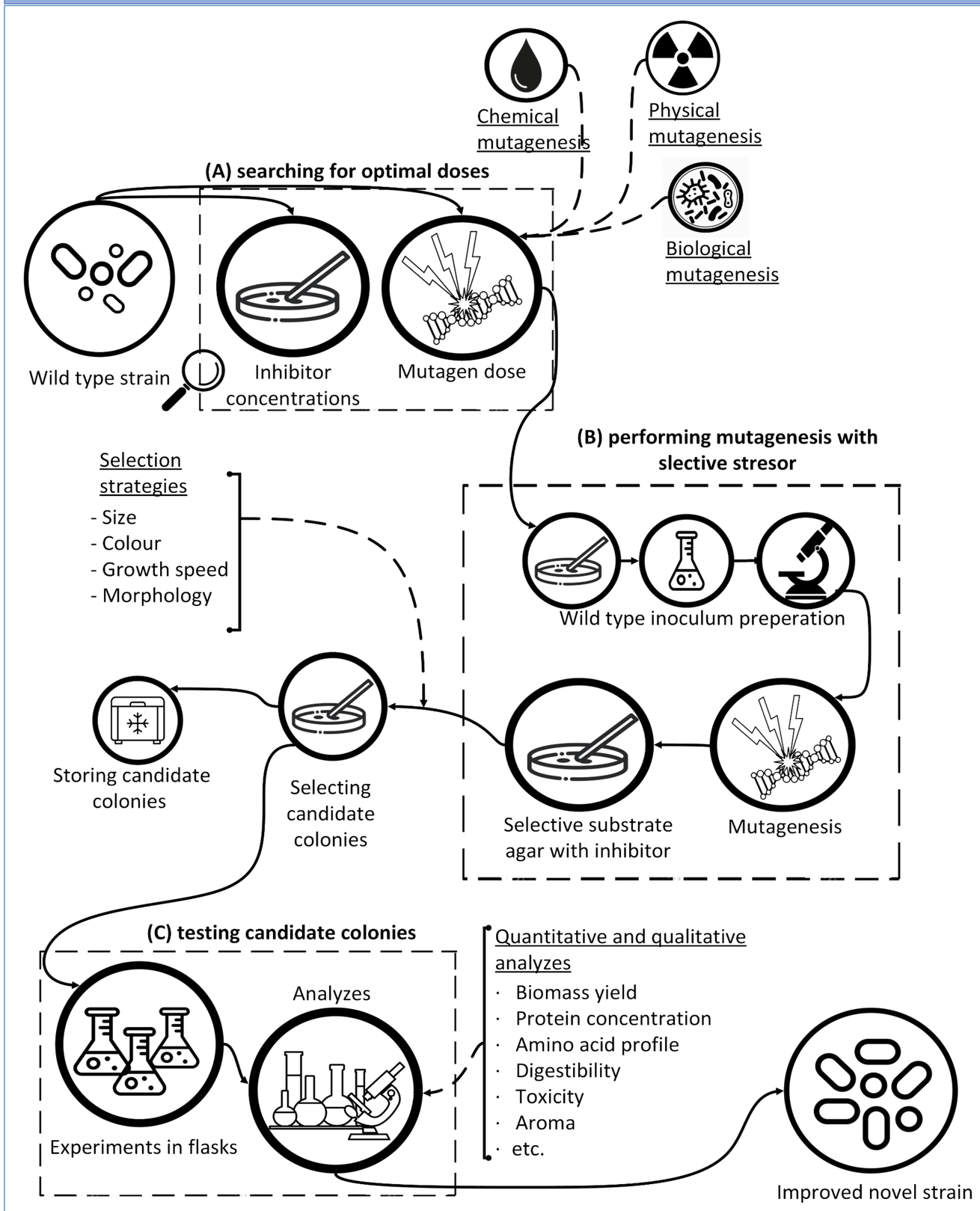
Introduction

This review expands the study of SCP production and provides protocols for the use of amino-acid inhibitors in the selection of microorganism mutants with enhanced protein production potential. In this approach, we use herbicides as amino-acid inhibitors to select random mutants with a higher potential for protein production. In contrast to wild-type strains, which are inhibited at a predetermined concentration, the mutant strains growing on such plates should exhibit increased protein synthesis to compensate for the inhibition. Subsequent cultivation without inhibitors is expected to result in a higher protein composition compared to the wild-type strain. The protocols, such as the use of the mutagens, as well as mutant selection strategies, combine theoretical considerations with practical applications and provide researchers with tangible methods to improve SCP-rich microorganism strains. The inclusion of herbicides as tools for the selection of SCP-rich mutants opens a novel avenue and contributes to the ongoing advances in sustainable protein production

Results and discusion



In this paper, we reviewed how herbicides and mutagenesis act as AA inhibitors, which may exert selective pressure on microbial strains and produce new strains with improved capacity for protein synthesis. By applying our described protocols, it might be possible to select better microorganism strains. At first, mutagens and inhibitor doses that promote cell inhibition should be determined. Inhibitor concentrations should be tested in several stages. At the beginning, in a wide range from 0.01 to 1000 mg/L. Then in a narrower range to determine the minimum concentration for complete inhibition of the target microorganism. Then a combination of two factors should follow: treating the strain with a mutagen and plating it on selective agar with an inhibitor. Afterward, the candidate colonies that have formed are potential mutants and need to be placed in permanent storage, used for detailed analyses to determine whether the desired mutation has occurred, if any additional side effects have appeared, whether the new strain is safe to use, etc. Candidate strains should also be tested for genetic stability - how many times the strain can be used before it is necessary to restore it from primary culture due to loss of desired mutation.

To increase the probability of finding new mutants, high-throughput screening should be applied. Our suggestion would be to use a micro-plate reader. It could improve research from an economical and practical standpoint by reducing the amount of agar plates needed. In this way, many candidates can be screened in a short period of time.

Conclusion

- By applying our described protocols, it might be possible to select better microorganism strains;
- Gained mutants should be used for detailed analyses to determine whether the desired mutation has occurred, if any additional side effects have appeared, whether the new strain is safe to use, etc.;
- To increase the probability of finding new mutants, high-throughput screening should be applied. The combination of high-throughput screening and careful experimental design can greatly accelerate the discovery of new mutants and drive scientific progress in SCP technology;
- By embracing SCP-production technology, we can take a crucial step toward building a sustainable and resilient future.

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