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| Journal Name: | **Journal of Advances in Biology & Biotechnology** |
| Manuscript Number: | **Ms\_JABB\_137499** |
| Title of the Manuscript: | **Utilizing Multivariate Analysis to Enhance Selection Methods for Seed Quality Characteristics in Rice (Oryza sativa L.)"** |
| Type of the Article | Original article |

PART 1: Comments

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|  | **Reviewer’s comment****Artificial Intelligence (AI) generated or assisted review comments are strictly prohibited during peer review.** | **Author’s Feedback** (It is mandatory that authors should write his/her feedback here) |
| **Please write a few sentences regarding the importance of this manuscript for the scientific community. A minimum of 3-4 sentences may be required for this part.** | This manuscript offers important contributions to rice breeding by identifying key seed quality traits and genetically diverse genotypes using multivariate analysis. The findings support more efficient selection strategies and have practical relevance for improving rice productivity and food security. The study also promotes the use of statistical tools to enhance precision in crop improvement programs. |  |
| **Is the title of the article suitable?****(If not please suggest an alternative title)** | Yes, the title "Utilizing Multivariate Analysis to Improve Selection Methods for Seed Ǫuality Traits in Rice (Oryza sativa L.)" is generally suitable. |  |
| **Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here.** | The abstract is generally comprehensive and captures the main objectives, methods, and findings of the study. However, some minor revision is recommended to improve clarity and coherence. Specifically, some sentences could be restructured for better flow, and technical terms should be used more consistently (e.g., full forms of abbreviations when first mentioned). In addition, highlighting the practical implications of the findings in a concluding sentence wouldstrengthen the conclusion of the abstract. This is followed in the final suggestion. |  |
| **Is the manuscript scientifically, correct? Please write here.** | Yes, the manuscript is scientifically correct. |  |
| **Are the references sufficient and recent? If you have****suggestions of additional references, please mention them in the review form.** | Yes, the references are sufficient and include several recent and relevant studies that support the research. |  |
| **Is the language/English quality of the article suitable for scholarly communications?** | Yes, the language and English quality of the article are suitable for scholarly communication. |  |
| Optional/General comments | The abstract needs to be more objective and present a clearer cohesion of ideas. It is recommended to reorganize the content to follow a logical sequence—starting with the objective, followed by methods, key results, and a concise conclusion. Simplifying some sentences and avoiding repetition will enhance clarity and make the abstract more aligned with scholarly standards.ABSTRACTThis study aimed to apply multivariate analysis tools to optimize selection methods for seed quality traits in rice (Oryza sativa L.). The experiment was conducted at the Plant Genetics and Breeding Laboratory of the Lovely Professional University, Jalandhar (Punjab), using 45 rice genotypes. Analysis of variance revealed significant differences among genotypes for the seven quantitative traits evaluated, indicating broad genetic variability. The genotypes Ram Lakshman, IET-22020, Shivanth, and DDR-119 showed the highest average seed vigor indices, while Ashoka 200, Ruchi Dhan, PR 131, and HUR-36 stood out for their higher germination speed, making them promising materials for breeding programs. The highest estimates of genotypic (GCV) and phenotypic (PCV) coefficients of variation were observed for seedling dry weight, followed bygermination speed, seedling length, and root length, indicating the feasibility of direct selection. |  |

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|  | High heritability and substantial genetic gain suggest additive gene effects, reinforcing the potential for selection response. Correlation analysis showed that seedling vigor was positively associated with germination speed, shoot length, root length, and total seedling length. These same traits exhibited direct positive effects on seed yield at both phenotypic and genotypic levels. Cluster analysis grouped the genotypes into eight distinct clusters, with the greatest intra- cluster distance observed in cluster VIII. Principal component analysis revealed five main components accounting for 80.11% of the total variation.Keywords: Oryza sativa, genetic variability, seed vigor, multivariate analysis, plant breeding.Reorganize the introduction to follow a clearer logical progression: begin with the global importance of rice, followed by its nutritional aspects, cultivation data, and finally, the justification for the need to increase production. It is also recommended to improve textual cohesion and use more objective scientific language, highlighting key data clearly.Rice (Oryza sativa L.), with a chromosome number of 2n = 24, is an important cereal crop of the Poaceae family and the Oryzoidea subfamily. It is commonly known as the "Global Grain" as it serves as a staple food in over 100 countries. Approximately 90% of global rice production and consumption occurs in Asia, where it is a major food source for nearly half of the world’s population (Yugandhar et al., 2018). Rice provides about 20% of the world’s dietary energy supply, being composed mainly of starch, with approximately 78–79% amylose and amylopectin. In addition to carbohydrates, rice is also a rich source of protein and essential vitamins, particularly B-complex vitamins such as thiamine and niacin, and contains significant levels of essential minerals including iron (Fe), phosphorus (P), and magnesium (Mg). Currently, rice is cultivated on 165.03 million hectares worldwide, with an estimated production of 776.46 million metric tons and an average productivity of 4.7 tons per hectare (FAOSTAT, 2023). With the global population projected to reach 9.1 billion by 2050, a 70% increase in food production will be necessary to meet future demands (Singh et al., 2021). In this context, enhancing rice production through strategies involving genetic improvement and the selection of superior agronomic traits becomes imperative. |  |

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| **PART 2:**  |
|  | **Reviewer’s comment** | **Author’s Feedback** (It is mandatory that authors should write his/her feedback here) |
| **Are there ethical issues in this manuscript?**  | *(If yes, Kindly please write down the ethical issues here in details)* |  |

**Reviewer details:**

**Virgínia Mirtes de Alcântara Silva, Brasil**