CHAPTER VI
CONCLUSION

Regional yield trials are multi-location field evaluations of a set of newly developed mungbean lines across representative environments, serving as a crucial step in plant breeding programs. They enable breeders to assess genotype performance, adaptability, and yield stability under diverse agro-ecological conditions. Simultaneously, the nutritional study of mungbean is equally important, as legumes are a vital source of plant-based proteins and play a significant role in enhancing global food security. In this thesis, the newly developed mungbean lines with resistance to powdery mildew (PM) and Cercospora leaf spot (CLS) were comprehensively evaluated in terms of agronomic performance, disease resistance, yield stability, nutritional quality, and their potential for sprout and microgreen production.

In the first part, eight mungbean genotypes were evaluated in regional yield trials, including three Thai-certified varieties (CN3, CN84-1, and SUT1), the disease-resistant line SUPER5, and four new breeding lines (P08, P12, P22, and P24). Trials were conducted across four multiple locations and two seasons to assess genotype performance under contrasting environmental conditions. Lines P22 and P24 consistently exhibited superior yield and broad adaptability, performing well in both the rainy and dry seasons, particularly under disease outbreaks of CLS and PM. P24 excelled at Phitsanulok and Phetchabun and demonstrating synchronous maturity. P12 showed strong disease resistance and promising dry season performance at Nakhon Ratchasima but was limited by delayed flowering, maturity and rainy season lodging. Although P08 had slightly lower yield than P22 and P24, it displayed the highest yield stability, supporting its suitability for cultivation under variable environments. GGE biplot analyses reinforced these observations, showing P22 to possess both high performance and acceptable stability, P08 to have the highest stability across pods/plant and 100 seed weight, and P24 had balance high yield with moderate stability. The 'Which-won-where' and 'Discriminative vs. Representativeness' analyses further emphasized the importance of genotype × environment interaction (GEI) and highlighted Nakhon Ratchasima and Chai Nat as ideal testing locations. These result

suggest that P22 and P24 are strong candidates for varietal release, while P12 and P08 offer value in targeted or stress-prone environments.

Building upon these agronomic findings, the second part of the study evaluated nutritional composition and morphological traits of seeds and sprouts from seven genotypes (P08, P12, P22, P24, D5, CN3, and CN84-1) grown in two contrasting environments: rainy season in Phitsanulok (PNR) and dry season in Chai Nat (CND). Significant effects of genotype, environment, and GEI were observed on most nutritional traits, highlighting the critical role of both genetics and growing conditions. Dry season seed samples exhibited stability and higher protein content, while rainy season samples contained elevated levels of moisture, fat, and carbohydrates. For the seeds, varieties CN3 and CN84-1 exhibited higher protein content, while P08 and P24 were rich in carbohydrates. For the sprouts. CN84-1 stands out as the most suitable for producing sprouts with high protein content, ideal for protein-enriched diets. P24 and P08 are preferable when higher carbohydrate content and desirable texture often linked to sweetness and appealing mouthfeel are prioritized. For applications emphasizing fiber, P22 offers additional nutritional benefits to digestive health. Sprout morphologically, root length showed significant variation among the genotypes, with CN3 producing the shortest root length, while CN84-1 and P24 produced the longest roots. However, hypocotyl diameter and length did not show significant differences.

To complement the sprout evaluation and assess further end-use potential, the third experiment focused on the morphological and nutritional characteristics of mungbean microgreens derived from nine genotypes, including a resistant line (SUPER5), the six newly developed lines (P08, P12, P22, P24, W5, and D5) and two varieties (CN3 and CN84-1). While hypocotyl length did not vary significantly among genotypes, substantial differences were observed in leaf (length and width) and output ratio. SUPER5 emerged as the most suitable for microgreen production, excelling in protein content and output efficiency along with P22 also exhibited high in protein content. D5 displayed the highest carbohydrate level, whereas CN3 and SUPER5 exhibited lower carbohydrate content. Fat content showed only slight differences across the genotypes. The superior fiber content was higher in CN84-1. CN3 had the highest ash content, while moisture content remained consistently high across all genotypes.

Taken together, these three interconnected experiments provide a comprehensive assessment of newly developed mungbean lines across multiple dimensions, from field performance to nutritional quality. The regional yield trials confirmed the importance of multi-environment testing in identifying stable, high-

yielding genotypes such as P22 and P24, emphasizing the significance of GEI and the utility of GGE biplot analysis for genotype selection. The nutritional and morphological evaluation of seeds, sprouts, and microgreens highlighted variation in nutrient profiles. Overall, this study demonstrates that regional yield trials are essential in mungbean breeding programs for selecting adaptable and stable genotypes under diverse agro-ecological conditions. Furthermore, the nutritional evaluation of seeds, sprouts, and microgreens reinforces the role of mungbean as a plant-based protein source vital to global food security. The integration of agronomic, morphological and nutritional data in this study supports the selection of elite mungbean lines for varietal release, targeted cultivation, and diversified utilization in plant breeding programs. In terms of nutritional content, the breeding objective influences the selection of genotypes. Genotypes CN3 and CN84-1 have high protein content in seed, while P08 and P24 yield higher carbohydrate content in both seed and sprout production. Similarly, CN84-1 produces sprouts with high protein content, while P08 and P24 produce sprouts with high carbohydrate content. P22 has the highest fiber content in sprouts. Line SUPER5 was the most suitable for microgreen production due to its high protein content and highest output. Meanwhile, CN84-1 exhibited the highest fiber content in microgreens.

The findings from these experiments can serve as a foundation for future breeding strategies aimed at enhancing both yield and nutritional quality in mungbean. The identified elite lines can be further evaluated under farmers' field conditions or integrated into participatory breeding programs to ensure practical applicability and acceptance. Additionally, the nutritional insights gained from seeds, sprouts, and microgreens open new avenues for value-added product development tailored to health-conscious consumers. Further molecular and genomic studies could also validate the observed traits and accelerate the development of superior mungbean variety.