

(Form No. 14)

## ABSTRACT OF DOCTORAL THESIS

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Title: A genome-wide association study on lodging resistant related traits in the Ethiopian germplasm collections of teff (*Eragrostis tef*)

( エチオピアのテフ (*Eragrostis tef*) 遺伝資源における倒伏耐性関連形質に関するゲノムワイド関連解析 )

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Teff is the most strategic cereal crop grown from high rainfall to drought prone areas of Ethiopia, where it covers nearly 30% of the area under cereals. However, its productivity remains very low due to lack of knowledge and research interventions, particularly the crop is susceptible to lodging. The aims were to investigate the grain yield potential, the genetic diversity, and dissect the genetic basis of lodging resistance related traits of teff using genome-wide association study (GWAS). A pot experiment with intensive management where lodging was controlled artificially, and a field experiment with conventional management using the same 317 genotypes and additional three improved cultivars in the field experiment were carried out. The result showed a highly significant variation among the genotypes for grain yield, biomass, harvest index, and phenological traits under both experiments. The best linear unbiased predictor (BLUP) adjusted grain yield performance of the genotypes ranged from 4.2 to 8.8 g/plant in the intensive management and 1.8 to 4.3 g/plant in the field growing condition with conventional management. Coefficient of genetic variation, heritability and expected genetic advance for grain yield were the highest in both experiments. Traits contributing to lodging resistance, such as internode diameter, pushing resistance, and base failure moment, were significantly positively correlated with each other and with plant height. Similarly, the correlation of those traits with lodging index was significant and positive. In contrast, tiller number showed a significant negative correlation with lodging index. The peduncle–panicle length, which generally accounted for 59% of the plant height, should be a target when breeding for semi-dwarfism. GWAS identified significantly associated SNPs ( $P < 0.001$ ) for important lodging resistance related traits. Thus, the genotypes under this study showed useful characteristics which can be exploited in the breeding program. Increased stem strength, wider stem diameter, and reduced tiller number could worth considering as a selection criterion.

“\* In addition, some of the figures, etc., have been omitted.”