（学位第３号様式）

学　位　論　文　要　旨

氏　名	Yoshihiro Nakao
題　目	Development of Seed Priming Technology for Direct Sowing in Rainfed Rice Cultivation （イネの天水直播栽培における種子プライミング技術体系の確立）

Demand of rice is increasing rapidly in Sub-Saharan Africa (SSA) and rice production doubled from 2000 to 2018 caused by increasing rice cultivation area. However, rice yield did not increase much. Therefore, innovative technologies are needed for increasing rice yield in SSA. In SSA, large part of rice cultivation environment is occupied by rainfed field which depends the water resource on rainfall. The direct seeding is a standard method of rice sowing especially in rainfed upland rice cultivation. It is well known that plant emergence and establishment is important factors for subsequent growth and yield. In upland rice cultivation, plant emergence and establishment seem to be poor because of unstable rainfall amount.

Seed priming is pre-sowing treatment which improves initial, middle and late plant growth. Especially in hydropriming is known as low-cost and effective techniques applicable to SSA. In this dissertation, optimization of hydropriming technology was conducted for improving the rainfed upland rice cultivation. Then, we examined the treatment method and use of primed seeds that can be applied to SSA. Furthermore, we evaluated the agronomical efficacy of primed seeds in the initial, middle, and late growth stage of the plants in connection with the rice genotypes and environment.

To investigate methodology of hydropriming treatment, characters of farmer’s seeds are assessed in chapter 2. We clarified that seeds should be soaked for 24 h on 25℃ for promoting water absorption and activating metabolic pathways. Further, soaking rice seeds for 24 h prevents germination failure during seed priming process for the NERICA4 seed varieties used in Uganda. In chapter 3, adverse effects of hydropriming on rice seed was assessed, when the seeds were buried for long duration in dry soil. The adverse effects of seed priming seem not to be considered, even if the enzymes were activated before sowing and extremely drought was prolonged after sowing.

Further, we discussed the mechanisms underlaying differential efficacy of hydropriming in a wide range of soil moisture and genotypes as well as agronomical benefits in chapter 4, 5, and 6. Hydropriming efficacy was differed depending on soil moisture conditions and genotypes. Priming treatment facilitated root growth more strongly than control under low soil moisture condition. Furthermore, after re-watering, a good growth recovery was observed, which was presumably caused by improved initial growth of the seedling.

In this research, method of priming treatment was examined. Further, various problems related to variety of priming effects according to genotype and environment were examined. Through this dissertation, we clarified the benefits of application of hydropriming technology on upland cropping system.