非湛水管理による水稲栽培が群落内気温の日変化と収量に及ぼす影響

Effect of non-flooded water management on inside-canopy temperature dynamics, spikelet sterility and grain yield of lowland rice in the tropics

イネを非湛水条件で栽培した場合、穂温が上昇し、高温不稔が助長される可能性が指摘されている。しかし、野外での観測値は少ない。そこで、ガーナ北部の灌漑水田で栽培実験を繰り返し、非湛水管理による水稲栽培が開花時刻（午前）の群落内気温と高温不稔に及ぼす影響は小さいこと、一方で、乾季の出穂期間中に非湛水管理を行うと、午後から夜間の群落内気温が上昇し、収量が低下することを明らかにした。本成果は、水不足と高温の両方のリスクをもつ熱帯の水稲生産において、栽培時期に応じた適正な水管理技術の導入に活用できる。

Increasing temperatures and water scarcity are concomitant threats to rice production. On-farm trials in northern Ghana identified that non-flooded water management has little effect on inside-canopy temperature (Tc) at flowering time in the morning or on spikelet fertility, while in the dry season, the management increases Tc from solar noon to midnight and reduces grain yield. The result can help improve water-saving management during dry and wet seasons in the tropics and predict the combined effect of increasing temperature and water scarcity on rice production.

表1　水管理の違いが雨季作と乾季作におけるイネの不稔率および収量に及ぼす影響
Table 1. Effect of water management on spikelet sterility and grain yield in the wet and dry seasons

Variety	Water management	Spikelet sterility (%)				Grain yield (t ha^{-1})			
		Wet season		Dry season		Wet season		Dry season	
		2016	2017	2017	2018	2016	2017	2017	2018
IR64	Flooded	2.4^{b}	8.9^{a}	4.1^{b}	4.0^{a}	6.1^{ab}	5.2^{a}	6.1^{b}	6.3^{b}
	Non-flooded	2.3^{b}	5.9^{a}	7.5^{ab}	8.9^{a}	5.4^{b}	5.0^{a}	5.2^{c}	4.7^{c}
Jasmine85	Flooded	5.7^{a}	10.8^{a}	6.7^{b}	4.2^{a}	6.6^{ab}	5.6^{a}	7.4^{a}	7.7^{a}
	Non-floodd	2.6^{b}	8.2^{a}	11.8^{a}	7.2^{a}	7.0^{a}	5.5^{a}	6.4^{b}	6.4^{b}

Different alphabets indicate significant differences at 5% by Tukey's HSD test.

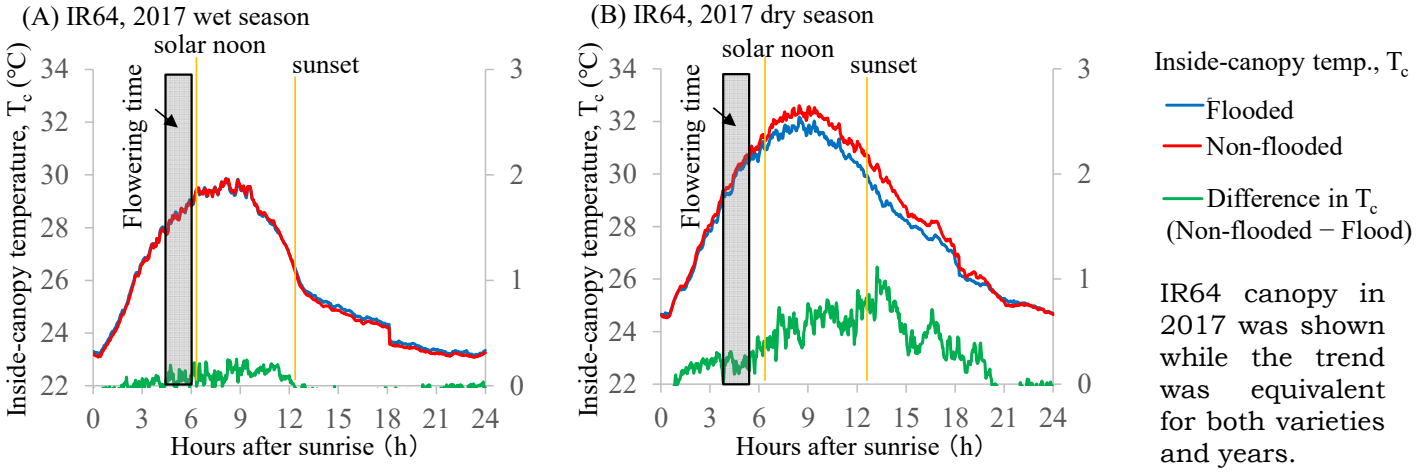

図2　水管理および栽培時期の違いが出穂期間中の群落内気温に及ぼす影響（IR64、2017）
Fig. 1. Changes in inside-canopy temperature (Tc) and Tc differences between water management schemes. 7-day average around the day of 50% heading except rainy days is depicted. Grey bars indicate the period from initial to peak spikelet opening time, determined by digital images at 10-minute intervals.

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