Malaysian Applied Biology (2023) 52(6): 1-10
https://doi.org/10.55230/mabjournal.v52i6.2690

Research

Reproductive Development and Yield Components of Bario Sederhana Rice in Response to Photoperiod

Putri Ainaa Afiqah Hossen and Hollena Nori*

Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, Malaysia
*Corresponding author: nhollena@unimas.my

ABSTRACT

A series of controlled environment treatments were conducted to quantify reproductive development and yield components of Bario Sederhana rice grown under five photoperiod regimes (8, 9, 10, 11, & 12 h). A 'broken-stick' linear regression of heading rate against photoperiod was used to determine the cardinal photoperiods for heading. The reproductive development towards photoperiod showed a delayed pattern in time to heading, anthesis, and maturity under lengthening photoperiod from 10 to 12 h. For example, under 10 h photoperiod the crops required 1680 °Cd (70.8 days) from emergence to heading but took an extended duration of 3147 °Cd (132.6 days) when they were sown at 12 h photoperiod. The prolonged time taken for reproductive development modified by photoperiod resulted in higher yield components. This is because the lengthening time from heading to maturity extended the duration of grain filling. The longest photoperiod of 12 h gave the highest percentage of filled spikelets (65.3%) thus consequently leading to the heaviest grain weight of 1.4 g per panicle. The base, optimum, and maximum photoperiod for heading were estimated to be 7.4 h, 10 h, and 14.8 h, respectively.

Key words: Day length, growing degree days, phenology, plant growth chamber, Sarawak traditional rice

Article History
Accepted: 3 December 2023
First version online: 31 December 2023

Cite This Article:
Hossen, P.A.A. & Nori, H. 2023. Reproductive development and yield components of Bario Sederhana rice in response to photoperiod. Malaysian Applied Biology, 52(6): 1-10. https://doi.org/10.55230/mabjournal.v52i6.2690

INTRODUCTION

The rice crop (*Oryza sativa* L.) is well adapted to a wide range of climatic variations from tropical to temperate. Several environmental factors, in addition to genetic factors, influence rice plant growth and development. Temperature is the most important determinant in crop development, however, it can be influenced by photoperiod (Vergara & Chang, 1985; Mapalana, 2017). Photoperiod also known as daylength, is defined as the duration from sunrise to sunset and includes civil twilight. Photoperiod influences crop development rate such as leaf production (Nemoto *et al*., 1995) and time to flowering (Jackson, 2009). Specifically, the modification in time taken to flowering caused by photoperiod variation can affect the growth performance and consequently affect the final yield production (Sonego, 2000; Nori *et al*., 2014).

In general, rice is classified as a short-day plant because it initiates panicle primordia in response to short photoperiods (Yoshida, 1981), which means it requires shorter exposure to daylight to transition from vegetative to reproductive phases. However, the degree of sensitivity to photoperiod varies widely among rice cultivars. It has been reported that traditional rice cultivars from tropical regions are photoperiod sensitive and require between 160-170 days to mature (Vergara & Chang,1985; Viraktamath, 2013; Nandini, 2020; Khotasena *et al*., 2022). Most of the studies on photoperiodism of traditional rice in the tropics are from Cambodia (Makara *et al*., 2001; Tsubo *et al*., 2009; Uch *et al*., 2023), Thailand (Cha-um & Kirdmanee, 2007; Boling *et al*., 2011; Sujariya *et al*., 2023), and Sri Lanka (Mapalana, 2017; Padukkage *et al*., 2017; Rathnathunga *et al*., 2019). The geographical locations of these countries are within 7.9 °N-15.9 °N latitude, thus experiencing different changes in day length throughout the year. In Malaysia, there was only one published work on the responses of rice toward