

**Delayed heading technique for early heading *Erianthus arundinaceus* collected in Japan**

*Erianthus arundinaceus* (Retz.) Jeswiet, a wild relative of sugarcane, has received attention as a sugarcane breeding material because of its high biomass productivity in ratoon crops and excellent tolerance to environmental stresses such as drought. Therefore, it has been increasingly utilized to improve sugarcane in several sugarcane breeding countries. However, many *E. arundinaceus* germplasm show earlier heading than that of sugarcane and this mismatch of heading periods between them is one of the biggest limiting factors to achieving intergeneric crossings. The aim of this study is to develop an effective delayed heading technique for early heading *E. arundinaceus* to achieve diverse intergeneric crossings with sugarcane.

Using the early heading Japanese *E. arundinaceus* accessions (JW630 and JW4) as experimental materials, we evaluated the effects on their delayed heading by photoperiodic treatment (PT) with different ratooning times (April, June, and July) (Fig. 1). In the PT plot, long-day treatment (i.e., the day length was extended for 14 h) was applied from 22 June to 23 August, and short-day treatment (i.e., the day length was gradually reduced by 30 min every 2 weeks) was applied from 24 August to 8 November. The illuminance below 1 m from the lamps was about 500 lux.

The heading periods in natural day length of JW630 (mid-September) and JW4 (late October) were earlier than the heading period of sugarcane breeding materials (early November to late December). The effects on their delayed heading were enhanced when we applied PT to the later-ratooning materials (Figs. 2, 3). The difference of average heading date between PT and natural day length plots was 2 days in JW630 and 8 days in JW4 with April-ratooning, 8 days in JW630 and 13 days in JW4 with June-ratooning, and 20 days in JW630 and 18 days in JW4 with July-ratooning. As a result, headings could be delayed in JW630 and JW4 until mid-November and late November, respectively, making it possible to cross them with sugarcane heading during these periods. Since pollen-germination rates in PT plots exceeded 25%, they can be used as a male parent for crossing with sugarcane.

This delayed heading technique combining PT and late-ratooning time will expand the possibility to utilize diverse early heading *E. arundinaceus* accessions for sugarcane improvement.

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Fig. 1. Photoperiodic treatment of *E. arundinaceus*.

Photo: Aug. 2011 at JIRCAS-TARF

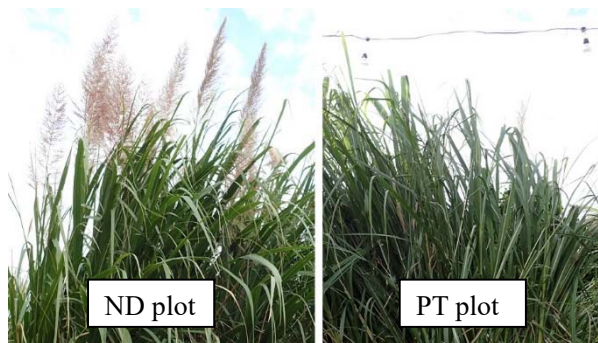


Fig. 2. Heading of JW4 in ND and PT plot.

ND and PT indicate natural day length and photoperiodic treatment, respectively.

Photo: 20 Oct. 2011 at JIRCAS-TARF

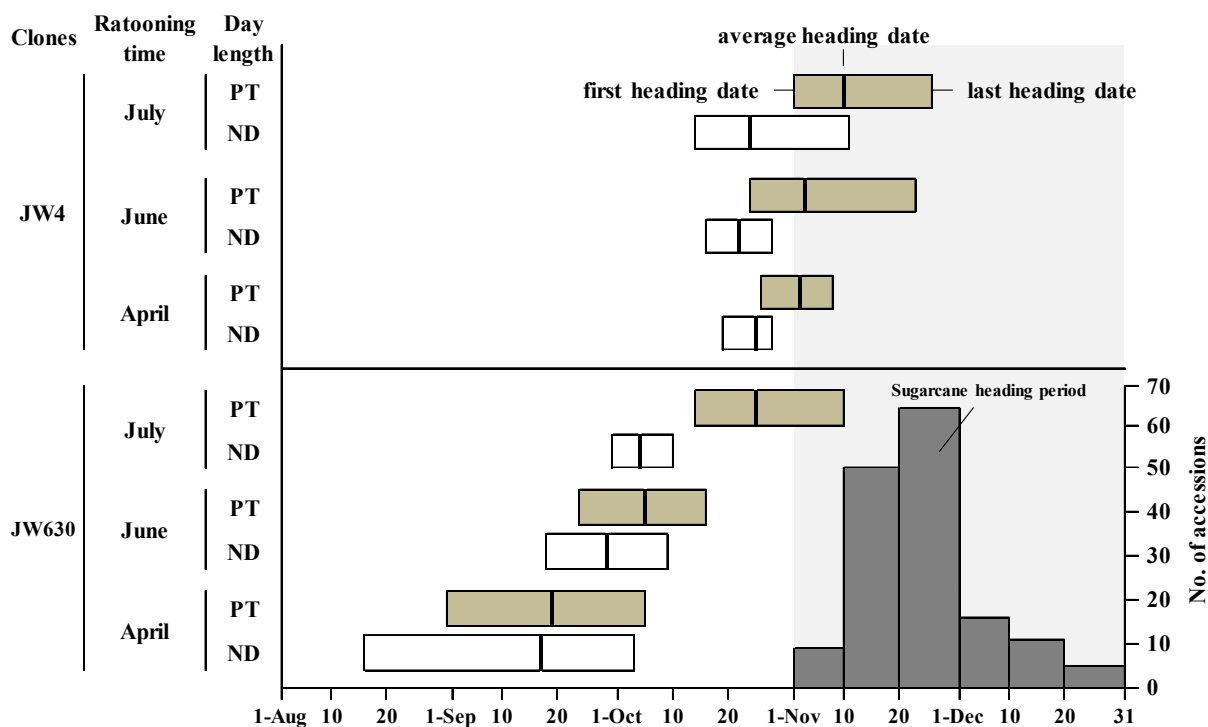


Fig. 3. Effects of ratooning time and photoperiodic treatment on heading dates of JW4 and JW630.

The data in the figure shows the average values of two-year experiments (2010, 2011).

PT and ND indicate photoperiodic treatment and natural day length, respectively.

The black bar means the distribution of the heading period in sugarcane varieties and clones (n=155) in 2009.

PT was more effective on delayed heading in later-ratooning plots, and a significant interaction was observed between ratooning time and day length in ANOVA ( $P < 0.01$ ).