



## EFFECT OF PACLOBUTRAZOL AND BENZYLADENINE ON FLOWERING AND FRUIT SETTING IN *Jatropha curcas* L.

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### Abstract

*Jatropha curcas* L. is a monoecious perennial biofuel plant belonging to the family Euphorbiaceae. This plant exhibits indeterminate flowering characteristics and has low number of female flowers resulting to its low yield. In this study, effect of paclobutrazol (PCB, 1,250 ppm) and 6-benzyladenine (BA, 125 ppm) on floral sex determination and fruit setting of *J. curcas* were determined. Although non-significantly different from control, ratio of female to male flowers and seed yield in PCB treated plant tended to be higher than the other treatments. This result is different from previously report by Pan and Xu (2010) on the higher female flowers in BA treated plants. Thus the effect of plant regulators on floral sex expression and seed yield in Thailand needs further investigation.

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**Keywords:** paclobutrazol, 6-benzyladenine, *Jatropha curcas*, seed yield, biodiesel

### Introduction

Biodiesel is one of the renewable energy that can be used to substitute petroleum diesel in transport sector. Biodiesel is methyl ester of oil seed plant such as soybean, sunflower, and oil palm. Most of them are edible, thus leading to competition of feedstock between food and fuel. Non-edible oil seed plant such as *J. curcas* is considered to use for biodiesel production (Thongbai et al. 2006, Basha and Sujatha. 2007, Syers et al. 2008). *J. curcas* is the oil seed plant in family Euphorbiaceae. The origin of this plant is in Central of America and Mexico (Heller 1996). It has been growing in South America, Mexico, Africa, and Asia. It is drought tolerance, grown widely in the tropic, but the yield is low because it is undomesticated with indeterminate flowering and the plant is too tall which made it difficult to harvest (Heller 1996). Conventional pruning is necessary to increase yield but might expose farmers to toxic substances in all parts of plant (Heller, 1996). These problems limit large scale production of *J. curcas*, and varietal improvement or breeding for increase number of female flower are needed (Heller 1996). Plant growth regulators and plant growth inhibitors are widely used for increase yield such as chlormequat chloride, 6-benzyladenine (BA), paclobutrazol (PCB) (Matsoukis et al. 2005, Ghosh et al. 2010, Wu et al. 2011, Rahim et al. 2011). The BA and PCB are used to increase number of flowering in several plants such as *Pharbitis nil* Chois (Ogawa et al. 1979), *Consolida orientalis* (Mansuroglu et al. 2009), mango (Rahim et al. 2011). In *J. curcas*, Ghosh et al. (2010) found the paclobutrazol increase the number of female flowers and seed yield, and Pan and Xu (2010) found BA increase number of female flowers and the newly induce bisexual flower, but the effect BA and PCB on flowering and fruit setting of *J. curcas* has not been compared.

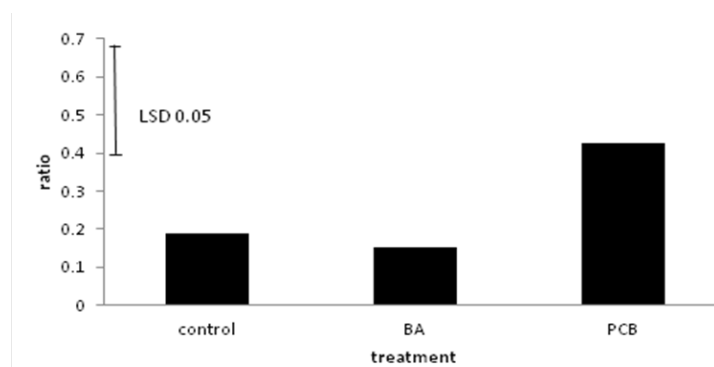
## Methodology

The pilot-scale experiment was set up at *J. curcas* experimental plantation at Mae Lao Development

Area, Mae Fah Luang University, Chaing Rai, Thailand. Water (control), 125 ppm BA (BA) and 1,250 ppm PCB (PCB) were applied on 3-year-old *J. curcas* shrub of Chiang Mai accession. This experiment was laid out in a randomized block design (RBD) with three replications. Three treatments were allocated to 10 plants for each treatment, randomly among the shrubs within each of the replication. All treatments were applied only once at the onset of flower initiation on 30 March 2012 by spray to inflorescence of the selected plants of each treatment. The number of male flowers, number of female flowers, number of female to male flowers ratio, seed yield were measured at 0, 6, 12, 25, and 63 days after applications. All data was analyzed using ANOVA according to the design (using SPSS 13.0 student version), and 0.05 level of probability was used as the decision level for the acceptance or rejection of all statistical significant in all analyses.

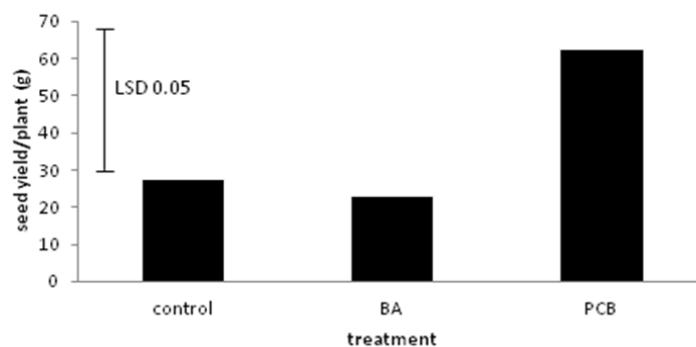
## Results

The number of male, number of female flowers, and seed weight of all treated plants was no significantly lower than control. However, the ratio of female to male flower was highest in the PCB treated plants (0.42) followed by control (0.18) and the BA treated plants (0.15) (Figure 1).



**Figure 1** Ratio of female: male flowers of *J. curcas* treated with BA, PCB, and untreated (Control).

Seed yield per plant are also followed the same trend, as the seed yield per plant were ranging from the treatments of PCB treated (62.5g), control (27.4g) and BA treated (23.1g), respectively (Figure 2).



**Figure 2** Seed yield per plant of treated plant with BA, PCB and untreated (Control).

## Discussion and Conclusion

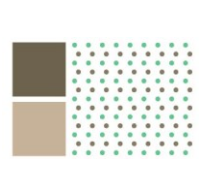
Auxin and gibberellin are the two phytohormones known to promote male flowers (Jayaram and Neelakandan 2000). Inhibiting auxin by BA and/or gibberellin by PCB have been proved to reverse these effects, increase female flowers and thus increase seed yield in many plants (Matsoukis et al. 2005, Ghosh et al. 2010, Wu et al. 2011, Rahim et al. 2011). Ghosh et al. (2010) and Pan and Xu (2010) separately tested the effect of BA and PCB in *J. curcas*. However, both inhibitors have not been compared in the same experiment before, so this is the first report of such comparison. Our result on the effect of PCB on increasing ratio of female to male flowers and seed yield of *J. curcas* is similar to previous report by Ghosh et al. (2010). However, the effect of BA on the ratio of female to male flower and seed yield in our experiment was non-significantly lower than control, which is different from previously report by Pan and Xu (2010). This might be the case that we used BA at concentration from them, or it might be the effect of epigenetics (Popluechai 2010, Pan and Xu, 2010). Therefore, the effect of plant regulators on floral sex expression and seed yield in Thailand needs further investigation.

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