

## Food plants suitable for mass rearing of the coconut hispine beetle *Brontispa longissima*

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### ABSTRACT

The invasive pest *Brontispa longissima* (Coleoptera: Chrysomelidae), native to Indonesia and Papua New Guinea, has extended its distribution to Australia, Asia and Pacific islands and caused serious leaf damages of the coconut palm *Cocos nucifera* in the invaded regions. Although biological control using parasitic wasps has successfully reduced population density and leaf damage levels, this pest and its natural enemies have not been efficiently produced in conventional methods using young leaves of *C. nucifera*. In the present study, we examined suitability of plants easily available in Thailand and Japan for mass rearing of this pest to develop effective mass rearing system of this pest. Mature, green leaves of the palms were also suitable for immature development and adult reproduction of this pest. Since mature leaves of *C. nucifera* are more abundant and less contaminated with fungus than the unopened leaf buds, mature leaves could be a promising plant diet for mass rearing of *B. longissima*. Ornamental palms such as *Hyophorbe lagenicaulis* and *Washingtonia filifera* were also suitable for immature development and reproduction of *B. longissima*. Away from palms, the cattail *Typha* spp. can sustain immature development and adult reproduction of *B. longissima*. In the area where *C. nucifera* is rare or not available, *W. filifera* or *Typha* spp. would be good food plants for mass rearing of this pest.

**Key words** : Alternative plants, *Brontispa longissima*, Coconut palm, Rearing, *Typha* spp.

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## INTRODUCTION

The coconut leaf beetle *Brontispa longissima* (Gestro) (Coleoptera: Chrysomelidae) is a leaf feeder of the coconut palm *Cocos nucifera* L. and other palms in tropics and the sub-tropics [1, 2, 3]. This pest is supposedly native to Indonesia and Papua New Guinea [1, 2, 3]. Recently, this pest has invaded into South East Asia such as Philippine, Thailand and Vietnam, causing serious leaf damages of *C. nucifera* [1, 2].

Biological control using parasitic wasps has considered successful to suppress populations of *B. longissima* in introduced countries [1]. Successful biological control of this pest was reported in introduced countries such as Celebes (Indonesia), Tahiti and the Solomon Islands, Samoa, and Taiwan [2]. Recently, leaf damages of *C. nucifera* dramatically decreased in Mekong Delta, Vietnam and in Hainan Island, China, after introduction of the larval parasitoid *Asecodes hispinarum* [4, 5].

Although laboratory rearing of *B. longissima* and its parasitoids has been conducted in introduced countries, provision of fresh materials has been an important limiting factor of its production. Fresh leaf buds of *C. nucifera* have been used for laboratory rearing of *B. longissima* [3]. However, the large amount of the fresh buds is not always available, because only one fresh bud develops on each *C. nucifera* tree every month, and fresh buds are normally collected only from short palm trees. Therefore, use of artificial diets or

alternative host plants that are more abundant than fresh leaf buds is necessary for effective mass rearing of these insects.

In the present study, we review studies on laboratory rearing of *B. longissima* using alternative host plants other than *C. nucifera* and discuss the possibility of use of alternative host plants for mass rearing of *B. longissima*.

### Use of *C. nucifera* mature leaves

Larvae and pupae of *B. longissima* were often found in unopened fronds and unopened leaflets of expanding fronds [6, Takasu, unpublished]. Although this fact suggests that mature leaves may be used for rearing of *B. longissima*, use of mature leaves in rearing of *B. longissima* has been neglected. Li *et al.* (2006) first examined suitability of young and mature leaves of *C. nucifera*, *H. lagenicaulis* and *W. filifera* for immature development of *B. longissima* [7]. Immature survival of *B. longissima* was higher for young leaves than mature leaves for all three plants. For *C. nucifera* and *W. filifera*, development time from first instar to pupation was significantly shorter for mature leaves than for young leaves. Pupal weights were not different between young and mature leaves in *C. nucifera* and *W. filifera*.

We also conducted laboratory experiments to compare suitability of young and mature leaves of *C. nucifera* for immature development and adult reproduction of *B. longissima*. When reared with either young or mature leaves in

Petri dishes, their survival was not different between the two types of leaves. However, development time from first instar to pupation was significantly shorter for larvae given mature leaves than those given young leaves (Yamashita *et al.* unpublished). This result is consistent with Li *et al.* (2006) [7]. Also, adults reared with mature leaves laid more eggs than those with young leaves. We also found that young leaves are easily contaminated with fungi, while mature leaves are not. Considering availability of leaves, mature leaves could be better diet for *B. longissima* in laboratory rearing than young leaves.

#### Use of other palms

Although *B. longissima* prefers to attack *C. nucifera*, it is known to attack more than 20 palm species in natural conditions, including *Roystonea* sp., *Archontophoenix alexandrae*, *Metroxylon sagu*, *Washingtonia filifera*, *W. robusta*, *Hyophorbe lagenicaulis*, *Livistonia chinensis*, *Chrysalidocarpus lutescens* and *Areca catechu* [8]. These facts indicate that *B. longissima* can be reared with other ornamental palm species in the laboratory.

In fact, this pest has been successfully reared with *H. lagenicaulis*, *W. filifera* [7], *C. lutescens*, and *Roystonea regia* [9] in addition to *C. nucifera* in laboratory conditions. For example, *B. longissima* larvae provided with *H. lagenicaulis* developed faster than those with *C. nucifera* [7]. These ornamental palms can be used as alternative hosts of *B. longissima* in

laboratory rearing.

We also examined suitability of native and exotic palms grown in Japan for immature development of *B. longissima*, including *C. lutescens*, *Collinia elegans*, *L. chinensis*, *Phoenix canariensis*, *Rhapis excelsa*, *R. humilis*, and *W. filifera*. We found that first instar larvae of *B. longissima* provided with *C. lutescens*, *L. chinensis*, *P. canariensis* and *W. filifera* developed to adults, and that among them, *W. filifera* was most suitable for *B. longissima* in terms of larval survival and development time. Although survival from first instar to adults was 80% on *W. filifera* on 87% on *C. nucifera* at 25°C, development time on the former was 23 days and shorter than 32 days on the latter at the same temperature (Yamashita *et al.* unpublished).

#### Use of *Typha* spp.

Although *B. longissima* normally attack palms in natural conditions, plants other than palms may be used as alternative hosts for rearing of this pest. Winotai *et al.* (2007) examined the possibility of the cattail *Typha angustifolia* as an alternative plant for rearing of *B. longissima*. *Typha angustifolia* is a common weed that grows in wetland in Thailand [3]. They found that *B. longissima* larvae provided with *T. angustifolia* developed faster than those with young leaves of *C. nucifera*, and suggested that *T. angustifolia* would be an alternative host plant for mass rearing of *B. longissima*. However, larval

survival and adult reproduction were not shown in their study [3]. To confirm results of Winotai *et al.* (2006), we conducted laboratory experiments to compare survival and development time of larvae, and survival and the number of eggs laid by adults between *T. angustifolia* and *C. nucifera*. Although there was no difference in larval survival, larvae given *T. angustifolia* developed to pupae faster than those given *C. nucifera*. Adults given *T. angustifolia* survived better and laid more eggs than those given *C. nucifera*.

We also examined suitability of *T. latifolia* in Japan for immature development of *B. longissima* and confirmed that *B. longissima* can be reared with *T. latifolia*. Approximately 45 % of first instar larvae developed to adults and development time from first instar to adult was 40 days.

## CONCLUSION

Although the limited number of information is available, we believe that mature leaves of *C. nucifera* would be a promising diet for mass rearing of *B. longissima*. In the area where *C. nucifera* is planted, the large number of mature leaves can be easily collected from trees because removal of several old leaves from a tree may not affect its growth and fruit production. Besides, use of mature leaves may have advantage because of smaller chance of fungal contamination.

Other palms and *Typha* spp. are also good candidates for alternative plants for rearing of *B. longissima* in the area where *C. nucifera* is not available. For example, *B. longissima* has already established on Okinawa or Ogasawara Islands, where *C. nucifera* is rare (Takasu *et al.* unpublished). There, *B. longissima* and its natural enemies might be reared with ornamental palms or *Typha* spp. grown in the islands to rear *B. longissima* and its parasitoids in the laboratory.

## REFERENCES

1. Konishi, K., S. Nakamura and K. Takasu. 2007. Invasion of the Coconut Hispine Beetle, *Brontispa longissima*: Current Situation and Control Measures in Asia. *NIAES International Symposium 2007 Invasive Alien Species in Monsoon Asia: Status and Control*.
2. Nakamura, S., K. Konishi and K. Takasu. 2006. Invasion of the coconut hispine beetle, *Brontispa longissima*: Current situation and control measures in Southeast Asia. *FFTC Seminar*. pp. 1-9.
3. Winotai, A., C. Sindhusake and R. Morakote. 2007. Brief Review on Biological Control of Coconut Hispine Beetle, *Brontispa longissima* in Thailand. *The APCC/FAO-RAP/APPPC Consultative Meeting on the Brontispa longissima*. pp. 1-8.
4. Guo, J. 2007. Coconut beetle management in Hainan Island, China: assessment of issues, new developments and future plans. *Report of the Asia-Pacific Forest Invasive Species*

- Network workshop*. pp. 47-54.
5. Tran T. V. 2007. Classical Biological Control of the Coconut Hispine Beetle (*Brontispa longissima* Gestro) in Viet Nam. *The APCC/FAO-RAP/APPPC Consultative meeting on the IPM of Brontispa longissima*. pp. 274-278.
  6. Waterhouse, D. F. and K. R. Norris. 1987. *Biological control: Pacific prospects*. ACIAR. pp. 131-141, Inkata Press, Melbourne.
  7. Li, Y., L. Cheng, Z. Peng and R. Ju. 2006. Influence of development stage of host plant leaves on the larval development and survival of *Brontispa longissima* (Gestro). *Chinese J. Trop. Agric.* 26: 17-20.
  8. Sankaran, K. V. 2007. Coconut leaf beetle. *Invasive Pest Fact Sheet*. <http://www.fao.org/forestry/media/13374/1/0/>
  9. Zeng, L., R. Zhou, Z. Cui, Y. Lu and G. Liang. 2003. Effect of host plants on development and survival of *Brontispa longissima* (Gestro). *J. South China Agricultural University*. 24: 37-39.