

Improving mass rearing techniques for *Cleruchoides noackae* (Hymenoptera: Mymaridae). Barbosa, L. (EMBRAPA, Brazil; leonardo.r.barbosa@embrapa.br), Beltramin, F. (EMBRAPA Florestas, Brazil; fabiele_belt@yahoo.com.br), Rodrigues, A. (EMBRAPA, Brazil; aperufforodrigues@gmail.com), Martinez, G. (Instituto Nacional de Investigación Agropecuaria, Uruguay; gmartinez@tb.inia.org.uy), Wilcken, C. (São Paulo State University, Brazil; cwilcken@fca.unesp.br).

The bronze bug, *Thaumastocoris peregrinus*, is an important pest affecting Eucalyptus plantations. The egg parasitoid *Cleruchoides noackae* was introduced in Brazil in 2012 for biological control of this pest. A mass rearing of *C. noackae* was established at EMBRAPA Florestas. This paper summarizes the main techniques developed to date in order to maximize the production of adult *C. noackae*. The use of eggs laid on towel paper strips increased the number of emerging parasitoids when compared to cutouts of Eucalyptus leaves. Host eggs 2 days old are preferred by *C. noackae* over 3- or 4-day-old ovipositors. Eggs can be stored at 5 °C for 30 days after being parasitized without significant effects on parasitoid emergence; such storage is a convenient strategy. The mean parasitoid emergence varies significantly with the density of host eggs; an increase in the number of host eggs offered reduced the number of parasitoids that emerged. These improvements have played a significant role in the production of *C. noackae* that has made possible mass release of *C. noackae* in Brazil and the establishment of natural populations of the parasitoid, as recently confirmed.

Evaluation of mortality in natural stands of *Pinus oocarpa* in Nicaragua. Bauman, T., Eckhardt, L. (Auburn University, USA; tab0032@auburn.edu; eckhalg@auburn.edu), Menard, R., Ward, J. (U.S. Forest Service, USA; rmenard@fs.fed.us; jward@fs.fed.us), Sediles, A. (Universidad Nacional Agraria, Nicaragua; albertosediles@yahoo.com).

Evaluations were conducted to determine the cause of mortality in sapling pine stands in the Nueva Segovia region of Nicaragua. These stands were natural regeneration in areas that had been devastated by *Dendroctonus frontalis* 10 years earlier. Approximately 10–20% of individual stands were affected. Mortality of individual trees occurred within 6–12 months after symptoms were observed. Observed symptoms included chlorotic and wilting foliage, black stained and resinous tissue in the roots and butt that extended into the stem, and insect galleries and feeding areas. Root samples of symptomatic trees were collected and traps for insect vectors were established. Material from insect galleries was also collected to determine species of fungi present. Galleries of a larger scolytid beetle were observed and *D. approximatus* was found. *Ips* spp. were present in some of the trees but were considered secondary. The objectives of this project are to determine the cause of this mortality, identify the insect and fungal associations, and describe the disease syndrome.

***Ninus taeda* roots represent a suitable host substrate for developing *Hylastes* spp. of bark beetles in Alabama, USA.**

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During an investigation into premature mortality in *Pinus taeda* stands in Alabama, *Hylastes salebrosus* and *H. tenuis* bark beetles were observed colonizing the roots of affected trees. To further understand the role of beetles in tree death, two primary lateral roots were selected for excavation from six trees in the stand. Root samples were taken from two trees with healthy green crowns, two trees with chlorotic and dying crowns, and two trees with red, dead crowns. *Hylastes* beetles were found to colonize the roots of dying and dead trees. Both larvae and pupae of *H. salebrosus* were identified in collected roots, providing direct evidence of beetle breeding within the roots of *P. taeda*. Adult beetles were rolled onto media and roots containing brood galleries were plated onto media to identify any fungi associated with these beetles. Of the beetles recovered, 47% were found to be transporting up to five species of ophiostomatoid fungi. The fungi were identified as *Leptographium terebrantis*, *L. procerum*, *Grosmannia huntii*, and *G. alacris*. In addition, one undescribed Ophiostoma species was isolated. These findings indicate dying and dead *P. taeda* roots provide suitable host material for *Hylastes* brood development.

Paper mulberry invasion in Ghana. Bosu, P., Apetorgbor, M., Nkrumah, E., Bandoh, K. (Council for Scientific and Industrial Research, Ghana; paul_bosu@yahoo.com; mapetorgbor57@gmail.com; enkrumah@csir-forig.org.gh; pbandoh@csir-forig.org.gh).

Broussonetia papyrifera [family Moraceae] is a highly invasive woody perennial introduced to Ghana from its native Southeast Asia. Regeneration of the species after forest clearing occurs by stumps, root sprouting, and seedlings from the seed bank. A recent study to assess the impact of *B. papyrifera* invasion in forest and forest-savanna transition sites has increased our understanding of its invasive patterns. In a comparative assessment of species composition in invaded and uninvaded stands, relative percent cover of resident species/guilds that included indigenous broadleaved species and grasses was significantly lower in invaded plots. Seven months after *B. papyrifera* was experimentally removed from invaded plots, indigenous broadleaved species increased significantly in removal plots at the forest site. At the forest-savanna transition site, however, the increase in percent cover of indigenous species was not significantly different from control plots. These results led to the conclusion that *B. papyrifera* may favour indigenous species communities in the transition zone, whereas its removal is more likely to favour regeneration in a forest zone. Studies have been planned to determine whether paper mulberry invasion alters soil physical and chemical properties and whether its competitive ability is mediated through allelopathic effects.

An economic comparison of prevention strategies against forest pathogens. Brunette, M., Caurla, S. (National Institute for Agricultural Research (INRA), France; marielle.brunette@nancy.inra.fr; sylvain.caurla@nancy.inra.fr).

This paper analyses strategies for prevention of forest pathogenic risks from an economic perspective. A forest economics methodology was developed within a cost-benefit framework in order to compare existing treatments to prevent the invasion of three pathogens (*Hylobius abietis*, *Dothistroma septospora* and *Dothistroma pini*, and *Heterobasidion annosum*) in Landes forest, in the southwest of France. Results show that for *Hylobius abietis*, prevention, either through self-insurance (Foster solution) or self-protection (fallow), appears to be more cost-effective than taking no preventive steps. For *Dothistroma septospora* and *Dothistroma pini*, results indicate that the treatment analysed, i.e., self-protection (*Diathane paysage*), is never economically feasible for the forest owner because it induces a negative land expectation value (LEV). The authors computed the threshold