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# Cane Weevil Borer, Rhabdoscelus obscurus (Coleoptera: Curculionidae), a Pest of Palms in Northern Queensland, Australia

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ABSTRACT

In recent years the cultivation of ornamental palms (Arecaceae) has increased markedly in northern Queensland. Consequently, several insects have become important pests, particularly *Rhabdoscelus obscurus* (Boisduval), the cane weevil borer. The larvae of this beetle feed on various species of palms, making the plants unsaleable. Death or lodging of the trees may also result. This paper documents its pest status, derived from information in the literature and from consultation with local growers.

Although *Rhabdoscelus obscurus* (Boisduval), the cane weevil borer, was originally described from New Ireland the original range of the species is unknown. Zimmerman (1968) believed that *R. obscurus* was probably native to the Papuan area, and has since spread, its current distribution ranging from the Celebes in Indonesia through New Guinea, south and east to Queensland, Polynesia, and Micronesia and north to Hawaii. Its spread is almost certainly associated with the transport of sugar cane by man.

Mungomery (1953) was of the opinion that *R. obscurus* first entered Queensland in infested sugar cane directly from New Guinea about 1896. Jarvis (1927) stated that it was first noticed in the Mossman and Johnstone River districts in 1907, spreading rapidly as far south as Mackay through unrestricted movement of seed cane between mill areas. By the mid 1930's *R. obscurus* was second only to cane beetle (Scarabaeidae: *Lepidiota* spp. and other genera) as a pest of sugar cane in Queensland. Some badly infested fields in the South Johnstone district had one in three stalks affected, with populations of over 250,000 larvae per hectare (Mungomery 1953). Mungomery (1953) believed that *R. obscurus* only reached its current negligible pest status in the sugar industry when preharvest burning of the crop became almost universal. This practice destroyed most emerging adults and milling killed most larvae and pupae.

The first enquiry we received about *R. obscurus* as a pest of palms in northern Queensland was related to an attack on coconut palm in Cairns in 1977. Since that time reports have gradually increased, with a large number being received over the last two years. Although this undoubtedly reflects an increased interest in growing palms in the area, long term enthusiasts interviewed believed that there was a definite increase in weevil activity over the last 2 to 3 years. The purpose of this paper is to provide an information base on this weevil and its importance to northern Queensland palm growers and to discuss the need or otherwise for further studies.

## Life History

Most literature on the life history of *R. obscurus* relates to sugar cane, especially from Hawaii where the weevil is still a major pest. The following information is largely from Napompeth et al. (1972). The adult female chews a cavity about 3 mm

deep in the sugar cane stalk, usually in adult feeding scars or cracks, sometimes at internodes or in leaf sheaths. A single egg is then laid, which hatches in 3–7 days (mean 4.6). The developing larva (Fig. 2) feeds on the pith (not the fibers), tunnelling up and down the stalk, occasionally breaking through to the surface leaving characteristic windows. The larval stage, which has about 6 instars, lasts from 45–61 days (mean 54.3). It then enters a prepupal stage of about 7 days, finally pupating in a cocoon made of a spirally woven mass of fibers and frass. After 17–25 days (mean 21) the adults emerge. Adult beetles (Fig. 1) are variable in color, with about 6 distinct patterns of light and dark markings. Each adult weevil is 10.0 ± 3.0 mm in length and 3.5 ± 1.1 mm in width, while weight varies from 21.3–118.2 mg (mean 66.1 in males, 67.8 in females). Adults are long lived, surviving up to 70 months in captivity, but probably less in the wild. Beetles fly infrequently and are most active around dawn and especially dusk. Van Zwaluwenburg and Rosa (1940) found that *R. obscurus* can move considerable distances (mainly by flight), marked and released specimens being taken up to 0.5 km from release sites. They concluded that wind was probably the main environmental influence on field movement and that most infestations in new fields came from adjacent fields, rather than carrying over from crop to crop. One female can lay up to 176 eggs, 90% of which are laid in the first 25 weeks (laboratory conditions). Eggs are not laid continuously but in short periods of activity.

Dharmaraju et al. (1979) discussed the weevil's life history in coconut palms. Eggs are laid in the epidermis of 4–6 year old trees. Up to several hundred larvae were found developing within the trunk of a single tree. Pink sap which exudes from wounds attracts other adults. Cocoons are found inside the trunk, the weevils leaving exit holes as they emerge. Heavy infestations weaken the trunk and the tree may fall over and die. Damage mostly occurs up to 1 meter above the ground.

## Overseas Hosts

*R. obscurus* is considered to be primarily a pest of sugar cane, although Muir and Swezey (1916) believed that the original hosts were likely to have been palms and bananas. Napompeth et al. (1972) listed corn, papaya, *Ravenala madagascariensis* J. F. Gmel. (traveller's tree) and *Strelitzia reginae* Banks (Birds-of-paradise) as alternate hosts and Zimmerman (1968) listed maize and other grasses, *Erianthus* spp. and *Inocarpus fagifer* (Parkinson) Fosb. (as *edulis* J. R. & G. Forster).

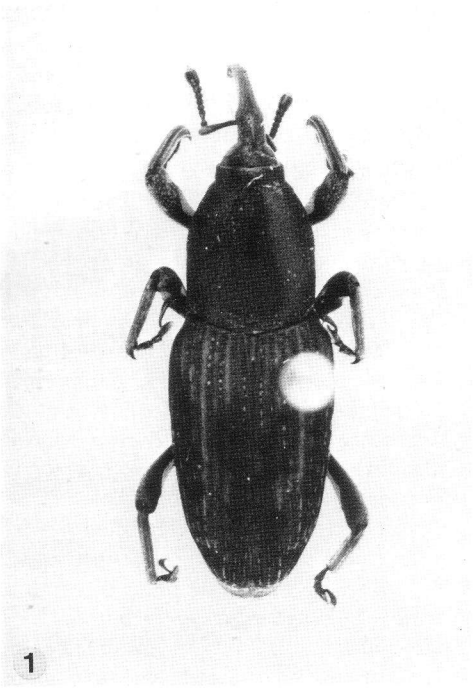
Napompeth et al. (1972) listed the following palms as hosts: *Archontophoenix alexandrae*—alexandra palm; *Areca catechu*—betel-nut palm; *Caryota urens* L.—wine palm; *Cocos nucifera*—coconut palm; *Metroxylon sagu* Rottboel—sago palm; *Pritchardia martii* (Gaud.) H. A. Wendl.—loulu palm; *Ptychosperma elegans*—solitaire palm; *Roystonea elata* (Bart.) Harper—royal palm; *Sabal palmetto* (Walter) Lodd. ex J. A. & J. H. Schultes—cabbage palm. Lever (1969) also listed *Cocos nucifera*, *Areca catechu* and *Metroxylon* spp. as hosts.

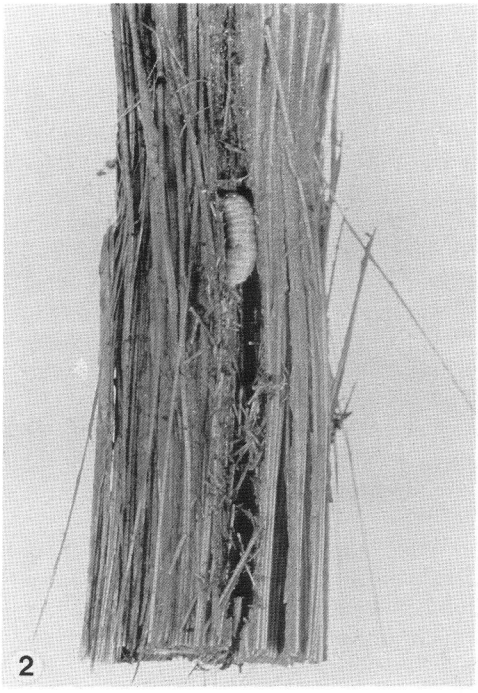
## Australian Hosts

The majority of available records in Australia are for sugar cane. Mungomery (1937) stated that he knew of no authentic record of *R. obscurus* feeding on bananas in Queensland. He did record *Archontophoenix alexandrae* as a host, the cocoons being present in felled wild trees.

## Natural Enemies

A tachinid parasite of *R. obscurus*, *Lixophaga sphenophori* (Villeneuve) was successfully introduced from Papua New Guinea by Jarvis, working with the Hawaiians, Muir and Kershaw, in 1910. By 1918






1. Adult *Rhabdoscelus obscurus*. 2. Mature larva of *R. obscurus* in trunk of young *Archontophoenix alexandrae*. 3. Damaged trunk of *Archontophoenix alexandrae*. Note jelly-like exudate from *R. obscurus* feeding hole. 4. Damage to potted *Archontophoenix alexandrae* by *R. obscurus*.

it was well established in the Mossman area and was then reared in numbers at the Meringa laboratories of the Bureau of Sugar Experiment Stations and widely released between Proserpine and Cairns. Although it was still present as late as 1952, Mungomery (1952) stated that parasitism rates rarely exceeded 5% which he attributed to the removal of available hosts by the yearly harvest. Wilson (1960) however, noted that *L. sphenophori* did exercise a high degree of control of *R. obscurus* where conditions were favorable, such as the Tully-Mossman area.

In addition to *L. sphenophori*, Muir & Swezey (1916) (except where indicated) listed the following as natural enemies of *R. obscurus*:

*Plaesius javanus* Erichson (HISTERIDAE)—Larvae and adults of this large beetle live inside weevil infested palms and bananas, feeding on weevil adults and larvae, especially on *Cosmopolites* and *Sphenophorus* (other weevil genera related to *R. obscurus*) in bananas. *P. javanus* was released in Cooran, southeast Queensland to control *Cosmopolites sordidus* (Germar), the banana weevil borer, in 1928 (Weddell 1932). One *Plaesius* larva can consume up to 34 weevil larvae per day, an adult averaging 8 per day. Waterhouse and Norris (1987) stated that despite several attempts to introduce this species into southeast Queensland and New South Wales from both Java and Fiji (where it had been successfully introduced), it failed to become established.

*Platysoma abruptum* Erichson (HISTERIDAE)—This species is similar to *P. javanus* but smaller.

*Simodactylus* sp. (ELATERIDAE)—Larvae feed on *R. obscurus* in palms, especially the pupal stage.

*Chrysopilus* sp. (RHAGIONIDAE)—Larvae of these flies feed on beetle and other fly larvae in palms and bananas. Waterhouse and Norris (1987) noted the introduction into Australia in 1928 of *Chrysopilus ferruginosus* Wiedemann against *C. sordidus*. Like the histerid *Plaesius javanus* it failed to establish. Zimmerman (1968) lists the elaterid, *Conoderus exul* (Sharp) and "various ants, mites, fungi and some other predators and parasites" as affecting *R. obscurus* numbers.

Other agents are also recorded as parasites or predators of *R. obscurus*, including rats which will eat the cocoons and *Bufo marinus* L., the cane toad, which commonly preys on *R. obscurus* adults (Wilson 1960). Wilson (1960) also reported that the green muscardine fungus *Metarrhizium anisopliae* attacks *R. obscurus* in Queensland and that the species was considered for biological control in 1923–24. He also reported the introduction of an unspecified entomogenous fungus from the Philippines in 1928. It was then cultured on media and transmitted to *R. obscurus*, but no further information is available on its success or otherwise.

## The Current Survey

Twenty-two growers were interviewed and their nurseries examined in late 1989 with regard to *R. obscurus*. For each nursery, notes were taken on size of plantings, establishment dates, range of palm species grown, and microhabitat. With respect to *R. obscurus*, data were obtained on amount and type of damage, palm species affected, age and situation (potted or field planted) of palms attacked, weather or seasonal effects noted by grower, and any control measures employed. These growers ranged from enthusiasts with an interest in palms, to commercial seedlings suppliers and producers of larger plants for landscaping. Large scale growers had trees in pots or in the field numbering several hundred thousand plants. The area covered extends from Cape Tribulation (100 km north of Cairns) south to Bramston Beach on the coast, plus Kuranda and Julatten at higher altitudes (300–400 m) on the Atherton Tableland. (see Fig. 7). All but five of these

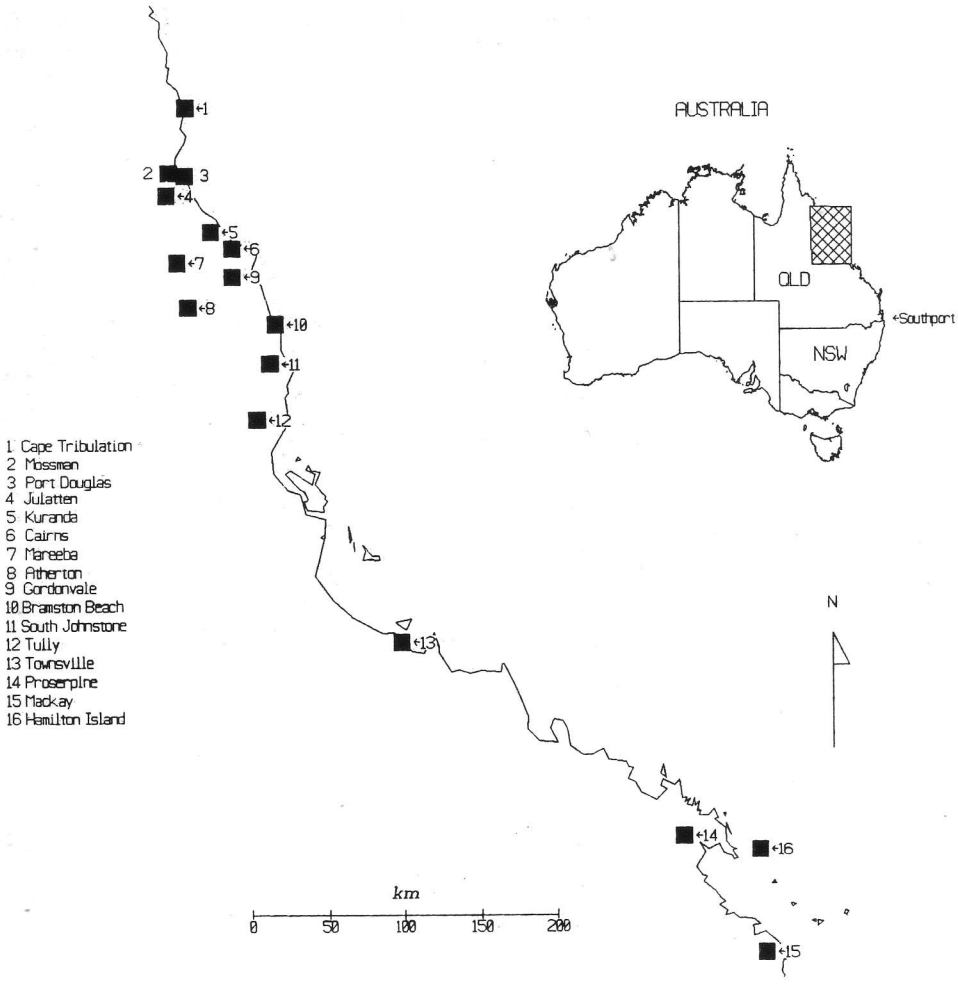
5. Damage by *R. obsurus* to trunk of *Wodyetia bifurcata*. Note cracking. 6. Damage to trunk of *Chrysalidocarpus madagascariensis* by *R. obscurus*. Note exudate from feeding hole and subsequent staining.

had weevil problems ranging from mild to severe. The five negative cases included some very recently established plots or those using heavy chemical control programs which apparently kept the weevils in check. The climate is tropical monsoonal with hot wet summers and warm dry winters.

Palm plantations are grown in a variety of habitat types ranging from rainforest to *Melaleuca* or *Eucalyptus* open forest, with several on former sugar cane land. There appears to be no correlation between weevil activity and habitat type, all areas being equally susceptible.

*R. obscurus* is active throughout the year in the region, although several growers believed there was increased activity in the wetter summer months. Others also believed there was an increase in activity in the dry late winter/early spring period. This could indicate that there are two generations per year and this possibility was supported by larval sizes encountered during the survey—either large or very small, with no intermediates. The dry season peak also coincides with the period of sugar cane harvest in northern Queensland, and beetles could be moving into palms as this host disappears. Growers believed that beetle activity was not influenced by short term weather patterns, but long term effects such as a series of wet or dry years could be expected to affect weevil numbers.

Table 1 lists the species of palms found to be hosts of *R. obscurus* at the time of the survey. Although most records were confirmed by the senior author, a few are species noted by growers as susceptible to attack. However, as adult and larval stages of the insect and its damage are quite distinctive, the grower records are accepted




7. Map of study area with place names used in text.

as valid. The most susceptible hosts are *Carpentaria*, *Chrysalidocarpus*, *Roystonea* and *Wodyetia*. However, this could reflect the palms most popular with growers. One long-term palm grower was of the opinion that there were few palms that *R. obscurus* would not attack.

The tachinid parasite *Lixophaga sphenophori* was found to be active at two coastal sites, one at Port Douglas and the other at Cape Tribulation. Adult flies emerged from *R. obscurus* pupal cells in *Carpentaria*, *Chrysalidocarpus* and *Metroxylon*. At the Port Douglas site, 36 weevil pupal cells were closely examined for fly pupae. Of these, 21 were found to be parasitized, each weevil pupal cell containing 1–7 fly pupae, with a mean of 2.4 fly pupae per parasitized weevil pupa. This high parasitism rate contrasts with the situation in weevil infested sugar cane where the parasite is rarely encountered, possibly due to low host numbers and the unsuitability of sugar cane fields for survival and development of the fly (K. Chandler, pers. comm.). The beetles *Dactylosternum*

*Table 1. Palm hosts of* Rhabdoscelus obscurus *(Boisduval) in northern Queensland.*

| Species | Common name | Native (N) or Exotic (E) |
|---|---|---|
| Coryphoideae | | |
| *Licuala* spp. | Licuala Palms | E |
| *Phoenix canariensis* Hort. ex Chabaud | Canary Island Date Palm | E |
| Calamoideae | | |
| **Metroxylon salomonense* (Warb.) Becc. | Solomon Sago Palm | E |
| **Pigafetta filaris* (Giseke) Becc. | Pigafetta Palm | E |
| Ceroxyloideae | | |
| **Hyophorbe lagenicaulis* (L. H. Bailey) H. E. Moore | Bottle Palm | E |
| Arecoideae | | |
| *Caryota mitis* Lour. | Clustered Fishtail Palm | E |
| **Chrysalidocarpus madagascariensis* Becc. | Green Cane Palm | E |
| **Chrysalidocarpus lutescens* H. A. Wendl. | Golden Cane Palm | E |
| **Neodypsis decaryi* H. Jumelle | Triangle Palm | E |
| *Phloga nodifera* Noronha ex. Salomon | — | E |
| *Dypsis* sp. | Dypsis Palms | E |
| *Euterpe* spp. | Assari Palms | E |
| **Roystonea regia* (Kunth) O. F. Cook | Cuban Royal Palm | E |
| **Archontophoenix alexandrae* (F. v. Mueller) H. A. Wendl. & Drude | Alexandra Palm | N |
| **Archontophoenix cunninghamiana* (H. A. Wendl.) H. A. Wendl. & Drude | Bangalow Palm | N |
| **Carpentaria acuminata* (H. A. Wendl. & Drude) Becc. | Capentaria Palm | N |
| **Normanbya normanbyi* (W. Hill) L. H. Bailey | Black Palm | N |
| **Wodyetia bifurcata* A. K. Irvine | Foxtail Palm | N |
| **Ptychosperma elegans* (R. Br.) Blume | Solitaire Palm | N |
| **Areca catechu* Ln. | Betel-nut Palm | E |
| **Dictyosperma album* (Bory) H. A. Wendl. & Drude ex Scheff. | Princess Palm | E |
| **Cocos nucifera* L. | Coconut Palm | E |
| **Syagrus romanzoffiana* (Chamisso) Glassman | Queen Palm | E |
| **Aiphanes caryotifolia* (Kunth) H. A. Wendl. | Coyure Palm | E |
| *Bactris gasipaes* Kunth | Peach Palm | E |

* Either adults, larvae or damage of *R. obscurus* seen by K.H.H. Palm classification after Uhl and Dransfield (1987).

*abdominale* (Fabricius) (Hydrophilidae) and *Platysoma* sp. (Histeridae) were found in weevil infested *Metroxylon* at Cape Tribulation, but it is not known if these were actually preying on *R. obscurus* larvae.

## Damage (Figs 3–6)

Adult *R. obscurus* were found sheltering under leaf bases e.g., on *Wodyetia*, and at the base of inflorescences. Adults were not observed causing damage in the palms, although R. Goebel (pers. comm.) reported numbers damaging the flowers of coconut. Adult feeding scars are recorded on sugar cane. It is not known where the eggs are laid although it is suspected that they are mostly deposited in the leaf bases.

Larval damage has been observed from just above and adjacent to the root mass to two meters or more above the ground.

In younger palms the larvae mine the central portion of the stem, completely destroying the plant. Damage extends up and down the stem for a number of centimeters from the initial point of entry. In older palms larvae mine the thicker leaf bases, e.g., *Metroxylon* and *Pigafetta*, as well as extending for a short distance into the trunk. Splitting occurred in specimens of *Wodyetia* with a trunk diameter of about 100 millimeters.

The obvious external symptoms of larval feeding in palms are listed below. The "windowing" which occurs in sugar cane was not observed.

(i) A jelly-like exudate from holes in leaf bases and/or stems (Fig. 3)
(ii) Splitting of the trunk at or near the base and further up the trunk (Figs. 4,5)
(iii) Staining of the trunk, especially if the palm sustains a high population of larvae (Fig. 6)

In young palms and older individuals of some species, e.g., *Neodypsis decaryi* and *Chrysalidocarpus madagascariensis*, the internal mining by larvae can cause death of the plant. Quite often a large area at the base of some species will be destroyed leaving the palm susceptible to lodging. Holes and splitting of the trunk cause disfigurement in older plants making them unsuitable for sale.

Pupation occurs in a case of spirally woven fibers. In some species, e.g., *Chrysalidocarpus lutescens* and *Carpentaria acuminata*, large numbers of pupal cases were observed protruding through splits in the trunk. These splits were presumed to be caused by extensive larval feeding. Pupal cases were also found at ground level within the remains of the trunks of dead plants.

## Discussion

*R. obscurus* is a member of the weevil subfamily Rhynchophorinae which includes many genera of economic importance, including the well known stored products pest *Sitophilus*, and the banana pests *Cosmopolites* and *Polytus*. Several other genera are important palm pests including the large *Rhynchophorus* spp. (up to 55 mm in length) and the smaller *Diocalandra* spp. (6–8 mm). Although the asiatic palm weevil *Rhynchophorus ferrugineus* (Olivier) has not yet been found in Australia, the four-spotted coconut weevil, *Diocalandra frumenti* (Fabricius) is occasionally taken in coconuts in northern Queensland where it seems to be secondary to *R. obscurus*. Hill (1983) stated that the pest status of *D. frumenti* was open to dispute.

It appears, from comments made by growers interviewed and by the numbers of enquiries received, that the incidence of *R. obscurus* in palms in northern Queensland is increasing. There would seem to be two factors contributing to this—the dramatic increase in number and size of plantings of palms for the nursery trade, and the trend back to green cane harvest in the sugar cane industry. Although there is no direct evidence, we believe that *R. obscurus* infestations in newly established nurseries primarily come from infested plants received from older established nurseries. Indeed this is backed up by recent outbreaks in southern areas (Hamilton Island and Southport in Queensland and even into New South Wales) where *R. obscurus* has not previously been known to occur. Once established in a nursery, populations build up giving the impression that the problem is increasing. The long term effect of the sugar cane industry returning to green harvest is not known. Although unburnt fields favor weevil development, modern cane varieties are much harder than those used earlier in the century and are much less susceptible to *R. obscurus* attack (K. Chandler, pers. comm.).

To control the weevil, most growers undertake routine crop hygiene, e.g., removal and destruction of dead fronds and infected material. Chemical control measures are not yet approved by the Depart-

ment of Primary Industries in Queensland but would undoubtedly have a place in a well managed nursery. Zimmerman (1968) believed that satisfactory biocontrol of *R. obscurus* would be exceedingly difficult. The tachinid *L. sphenophori* has been established in the area for 79 years and is unlikely to become more important than at present. Previous attempts (at least 5 between 1921–28) to introduce the histerid *P. javanus* have failed and it is unlikely that regulations now in force would allow importation into Australia of such a general predator as a biocontrol agent.

Further work on the problem should involve studies on the biology of *R. obscurus* in palm hosts, including egg laying sites and host susceptibility (Zimmerman 1968) felt that sick or injured palms were more prone to weevil attack). Trials of chemical control measures, their usefulness, best formulations and application techniques and timing would also be of benefit to the palm nursery industry.

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