

## THE STATUS OF AN EXOTIC SHRUB, *ACALYPHA SIAMENSIS* OLIV. EX GAGE (EUPHORBIACEAE), IN SINGAPORE

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### INTRODUCTION

The genus *Acalypha* is the third largest genus in the family Euphorbiaceae which consists of approximately 450 species (Sagun et al., 2010). There are 28 species that can be found in the Malesian region. One such species is the *Acalypha siamensis*, commonly known as the Siamese acalypha or tea leaves (Ministry of Law and National Development, 1970). It is native to Thailand, Vietnam, Peninsular Malaysia, Sumatra, and Sulawesi (Sagun et al., 2010).

*Acalypha siamensis* is a shrub growing up to 2.5 m tall (Fig. 1; Sagun et al., 2010). Its leaves are alternately arranged, with blades that are elliptic to obovate, and serrated along the margins. The bisexual spike bears female flowers subtended by large bracts with toothed margins at the lower end, and male flowers subtended by minute bracts towards the tip (Fig. 2). Flowering occurs almost throughout the year from January to November. The globose to oblate fruits are trilobed and covered with spines (Fig. 3). Dispersal of *Acalypha* species has not been well studied, but the typical explosively dehiscent fruits in the family Euphorbiaceae and the spines on its fruits suggest that *Acalypha siamensis* may spread mechanically and/or by animals.



Fig. 1. Flowering, leafy branches of a spontaneously growing *Acalypha siamensis* individual about 1.5 m tall along Kent Ridge Road. (Photograph by: Teo Siyang).



Fig. 2. Spikes showing the bracts with toothed margins at the lower end that subtend the female flowers, and the minute bracts subtending the male flowers above the female flowers. Scale bar = 1 cm. (Photograph by: Teo Siyang).



Fig. 3. Young, spiny fruits. Scale bar = 5 mm. (Photograph by: Teo Siyang).

## PRESENT STATUS IN SINGAPORE

There are seven *Acalypha* species in Singapore, of which five are exotic and two are cryptogenic, being of uncertain origin (Chong et al., 2009). *Acalypha siamensis* is the only exotic species that is known to have escaped cultivation and become a casual species (Chong et al., 2009). Holttum (1953) mentioned that *Acalypha siamensis* is one of the best hedge plants for Singapore and Peninsular Malaysia, and it was commonly planted as a hedge in the 1960s and 1970s (HTWT, pers. obs.). *Acalypha siamensis* was also included in the handbook published by the Ministry of Law and National Development (1970) to publicise and popularise a selected group of hardy and easily cultivated plants. However, its popularity as a horticultural plant has been lost in recent decades. As such, we postulate that most of the spontaneous populations we observed are probably abandoned plants and/or were those dispersed from abandoned stock when planting intensity (and propagule pressure) was higher.

Based on our observations, we have recorded spontaneous occurrences of *Acalypha siamensis* in the various localities: along Kent Ridge Road, Mandai Track 7, the northern end of Punggol Road, Orange Grove Road, in Jurong Lake Park, Punggol residential estate, in the secondary forest off Commonwealth Avenue West, Kallang Riverside Park, Pearl's Hill City Park, and Bukit Batok Nature Park. All the plants were observed to be either fruiting or flowering when we surveyed the areas, indicating that they are capable of sexual reproduction to aid its spread. Most significantly, a fairly long stand of flowering and fruiting individuals can be found along the edge of the Nee Soon Swamp Forest behind the hedge of camwood (*Baphia nitida*) at Carpark A of the Executive Golf Course, at the end of Mandai Track 7.

To assess the invasiveness of *Acalypha siamensis*, a Weed Risk Assessment (WRA) was conducted (Table 1, Supplementary Material). Chong et al. (2010) had previously established the transferability of the Australian WRA to the tropics (Pheloung et al., 1999), and a WRA for *Acalypha siamensis* had been earlier conducted by Gordon & Gantz (2008), arriving at a score of 3. We updated their WRA score-sheet [available from the US Forest Service, Pacific Island Ecosystems at Risk (2008)] by modifying some of the responses with information from our own observations in Singapore, and obtained the same score of 3 (See Supplementary Material, Table 1). This score falls within the range of 1 to 6, indicating a need for further evaluation. Using the decision tree as a second screen as suggested by Daehler et al. (2004) for species with scores requiring further evaluation, Gordon & Gantz (2008) concluded that *Acalypha siamensis* is of low risk and could be accepted for import.

## CONCLUSIONS

The prevalence of spontaneous, reproductive individuals of *Acalypha siamensis* in built-up and natural habitats of Singapore indicates that it is likely to be naturalised locally. While the WRA score and screening implies a low risk of invasiveness, one should be aware of the lack of information to answer some of the questions in the WRA. Hence, even though we do not recommend discontinuing its cultivation, planting within the proximity of natural areas such as nature reserves should be discouraged, especially since this species is shade-tolerant and would grow well in the forest understorey.

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### SUPPLEMENTARY MATERIAL

Table 1. Weed Risk Assessment for *Acalypha siamensis* Oliv. ex Gage in Singapore. Questions and scoring system were obtained from US Forest Service, Pacific Island Ecosystems at Risk (2008), which are in turn, adapted from Pheloung et al. (1999). Species with a total score of less than 1 are of low risk; species with scores between 1–6 require further evaluation; and species with scores greater than 6 are of high risk.

S/N	Category	Question	Scoring system	Answer	Score
1.01	Domestication /cultivation	Is the species highly domesticated?	y = -3, n = 0	no evidence	
1.02		Has the species become naturalised where grown?	y = 1, n = -1	n	-1
1.03		Does the species have weedy races?	y = 1, n = -1	n	-1
2.01	Climate and distribution	Species suited to tropical or subtropical climate(s) (0-low; 1-intermediate; 2-high). If island is primarily wet habitat, then substitute “wet tropical” for “tropical or subtropical”.	refer to question (score used with 2.02 to answer 3.01–3.05)	high	—
2.02		Quality of climate match data (0-low; 1-intermediate; 2-high)	refer to question (score used with 2.01 to answer 3.01–3.05)	high	—
2.03		Broad climate suitability (environmental versatility)	y = 1, n = 0	1	1
2.04		Native or naturalised in regions with tropical or subtropical climates	y = 1, n = 0	y	1
2.05		Does the species have a history of repeated introductions outside its natural range?	y = -2, ? = -1, n = 0	n	0
3.01	Weed elsewhere	Naturalised beyond native range y = 1* multiplier, n = answer to question 2.05	refer to question	n	0
3.02		Garden/amenity/disturbance weed	y = 1*multiplier, n = 0	n	0
3.03		Agricultural/forestry/horticultural weed	y = 2*multiplier, n = 0	n	0
3.04		Environmental weed	y = 2*multiplier, n = 0	n	0
3.05		Congeneric weed	y = 1*multiplier, n = 0	y	2
4.01	Undesirable traits	Produces spines, thorns or burrs	y = 1, n = 0	n	0
4.02		Allelopathic	y = 1, n = 0	no evidence	
4.03		Parasitic	y = 1, n = 0	n	0
4.04		Unpalatable to grazing animals	y = 1, n = -1	no evidence	
4.05		Toxic to animals	y = 1, n = 0	n	0
4.06		Host for recognised pests and pathogens	y = 1, n = 0	no evidence	
4.07		Causes allergies or is otherwise toxic to humans	y = 1, n = 0	n	0
4.08		Creates a fire hazard in natural ecosystems	y = 1, n = 0	n	0
4.09		Is a shade tolerant plant at some stage of its life cycle	y = 1, n = 0	y	1
4.10		Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y = 1, n = 0	y	1
4.11		Climbing or smothering growth habit	y = 1, n = 0	n	0
4.12		Forms dense thickets	y = 1, n = 0	y	1
5.01	Plant type	Aquatic	y = 5, n = 0	n	0
5.02		Grass	y = 1, n = 0	n	0
5.03		Nitrogen-fixing woody plant	y = 1, n = 0	n	0
5.04		Geophyte (herbaceous with underground storage organs—bulbs, corms, or tubers)	y = 1, n = 0	n	0
6.01	Reproduction	Evidence of substantial reproductive failure in native habitat	y = 1, n = 0	n	0

NATURE IN SINGAPORE 2011

S/N	Category	Question	Scoring system	Answer	Score
6.02		Produces viable seed.	y = 1, n = -1	y	1
6.03		Hybridises naturally	y = 1, n = -1	no evidence	
6.04		Self-compatible or apomictic	y = 1, n = -1	no evidence	
6.05		Requires specialist pollinators	y = -1, n = 0	no evidence	
6.06		Reproduction by vegetative fragmentation	y = 1, n = -1	no evidence	
6.07		Minimum generative time (years) 1 year = 1, 2 or 3 years = 0, 4+ years = -1	refer to question	unknown	
7.01		Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y = 1, n = -1	y	1
7.02		Propagules dispersed intentionally by people	y = 1, n = -1	n	-1
7.03		Propagules likely to disperse as a produce contaminant	y = 1, n = -1	n	-1
7.04	Dispersal mechanism	Propagules adapted to wind dispersal	y = 1, n = -1	n	-1
7.05		Propagules water dispersed	y = 1, n = -1	n	-1
7.06		Propagules bird dispersed	y = 1, n = -1	no evidence	
7.07		Propagules dispersed by other animals (externally)	y = 1, n = -1	no evidence	
7.08		Propagules survive passage through the gut	y = 1, n = -1	no evidence	
8.01		Prolific seed production (>1000 m <sup>-2</sup> )	y = 1, n = -1	n	-1
8.02		Evidence that a persistent propagule bank is formed (>1 yr)	y = 1, n = -1	y	1
8.03	Persistence attributes	Well-controlled by herbicides	y = -1, n = 1	no evidence	
8.04		Tolerates, or benefits from, mutilation, cultivation, or fire	y = 1, n = -1	no evidence	
8.05		Effective natural enemies present locally (e.g. introduced biocontrol agents)	y = -1, n = 1	no evidence	
			<b>Total Score</b>		<b>3</b>