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The TRIN Environmental Weeds project



Environmental weeds invade our bushland, placing pressure on native species and reducing biodiversity.

The TRIN Environmental Weeds project is addressing areas where the lack of taxonomic knowledge impedes the ability for managers to control weeds and is focused on selected Weeds of National Significance, e.g. Lantana, Willows and Bitou Bush.

Transforming management questions into taxonomic questions is a powerful tool for informing weed management since:

- genetic approaches are fast and reliable
- combining studies at every level of biological organisation yields insights that would otherwise be missed, and
- considering taxonomic relationships between species and populations in the context of ecological and geographic parameters leads to new thinking.

Case Study: Improving the biocontrol of weedy Lantana

Originating in the Americas and introduced to Australia in the early 1840s, the highly invasive Lantana is a serious weed of natural environments, pastures, and farmland throughout the tropics and sub-tropics.

The long history of hybridisation and redispersal of Lantana around the world has clouded the weed's origins, negatively impacting the hunt for a successful biological agent.

The TRIN Environmental Weeds project has targeted biocontrol agent discovery efforts by unravelling the origins and genetics of weedy Lantana using modern taxonomic tools.

As a result, we are able to better understand:

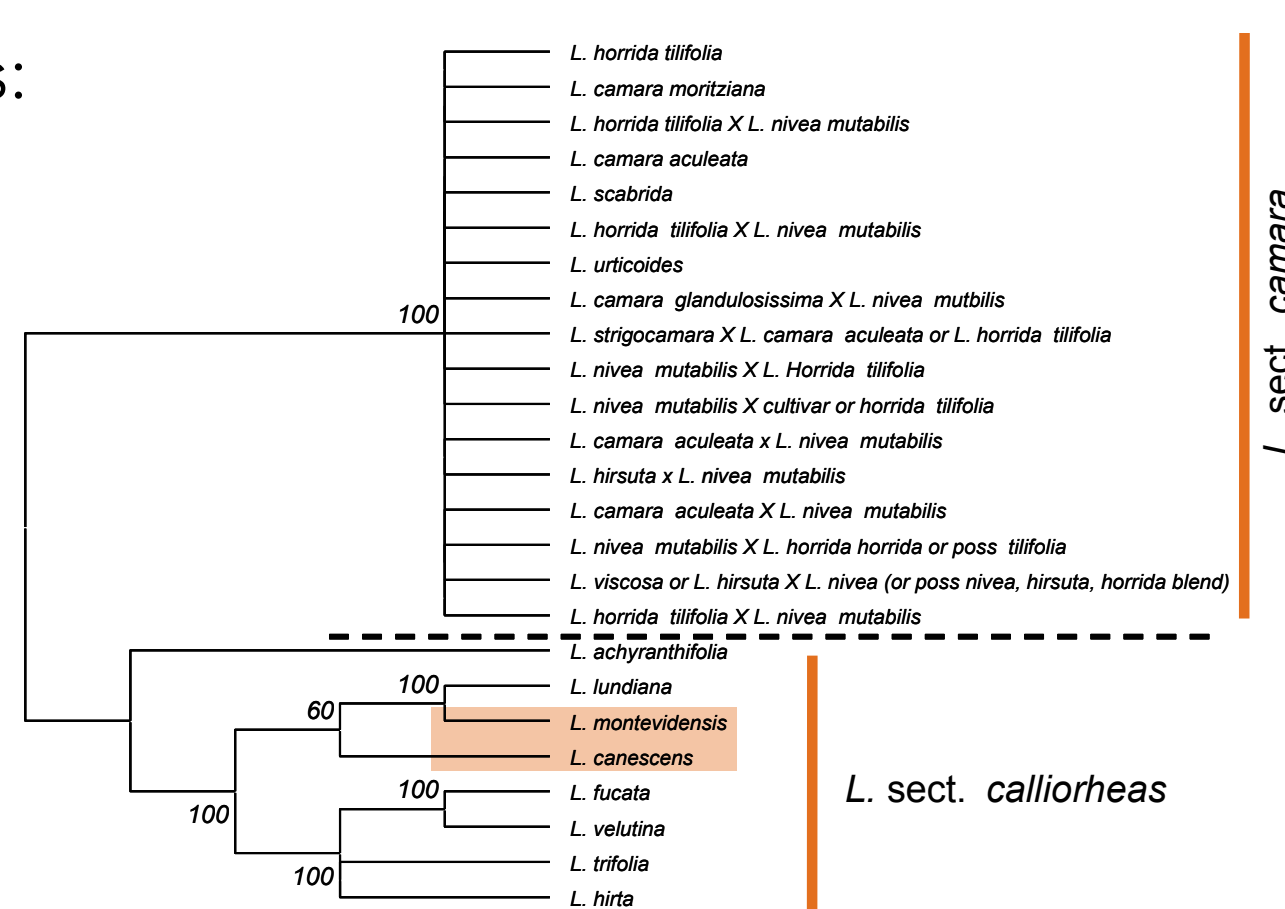
- the precise geographic origin of the weedy Lantana
- the relationships among Australian weedy Lantana varieties, and
- how traits important for resistance to biocontrol agents are distributed among them.

What is weedy Lantana?

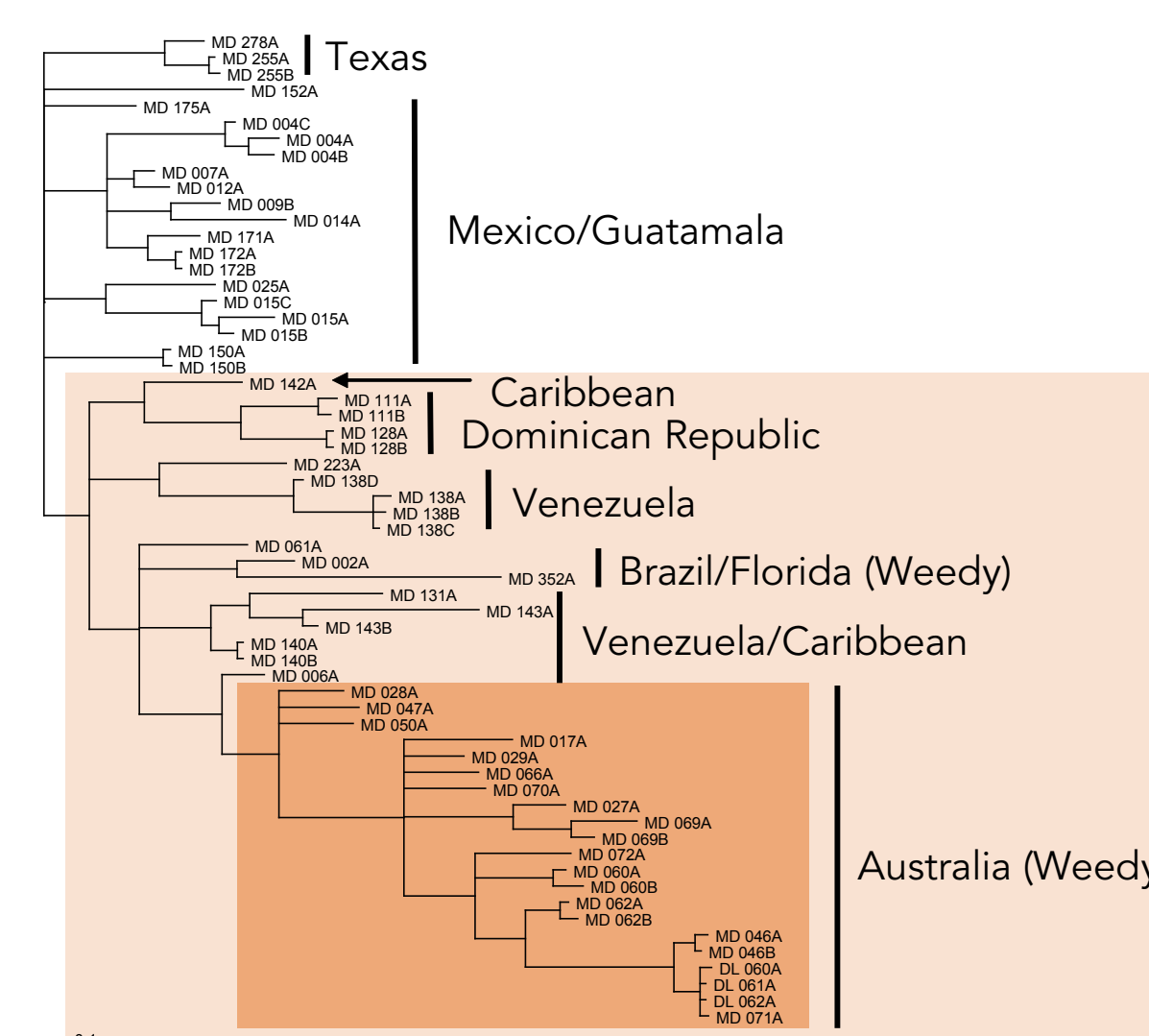
Genetic profiling of Lantana from Australia and the Americas revealed that Lantana sect. *Camara* (weedy Lantana) is probably derived from a single widespread species with considerable morphological variation, rather than from a horticultural crossing of a multitude of species.

This tree based on DNA data shows:

- Lantana sect. *Camara* (weedy Lantana) is one species, and
- other lantanas found in Australia, *L. canescens* and *L. montevidensis*, are clearly distinguished species, even though closely related.



Where did Australian Lantana come from?



Based on the single species model, it is possible to map the origins of Australian weedy Lantana – it is genetically most similar to Lantana from the Caribbean and Venezuela.

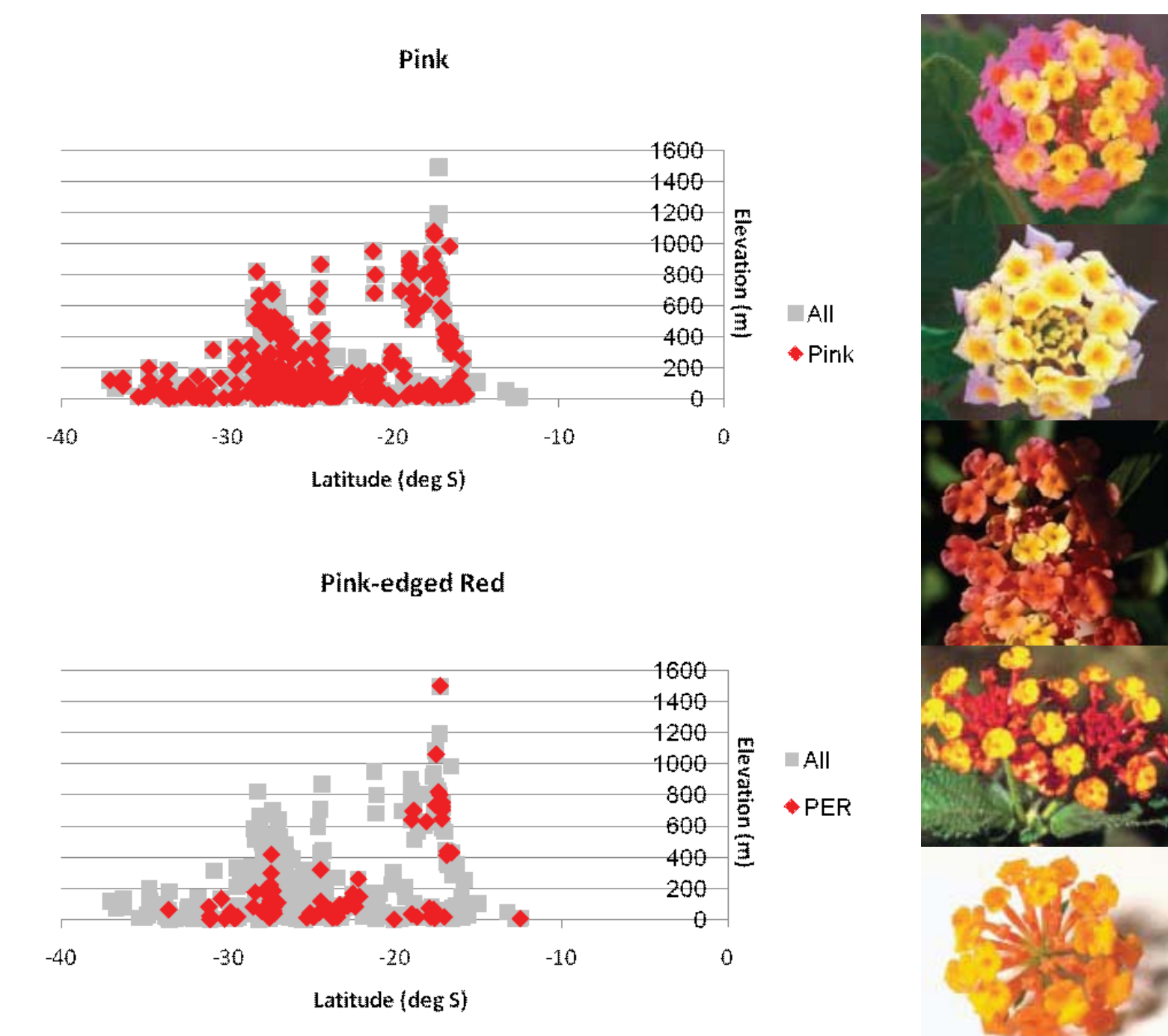
The majority of biocontrol agents have been sourced from countries other than the Caribbean and Venezuela, e.g. Brazil and Mexico. Efforts need to be refocussed to these localities to ensure optimal sourcing of biocontrol agents.

What does flower colour tell us?

Besides identity and origin, other key traits can reveal insight into the effectiveness of biocontrol.

A simple trait like flower colour shows that Australian weedy Lantana flower colours are:

- not distributed randomly
- have different geographic profiles, and
- are susceptible or resistant to different biocontrol agents.



Management implications

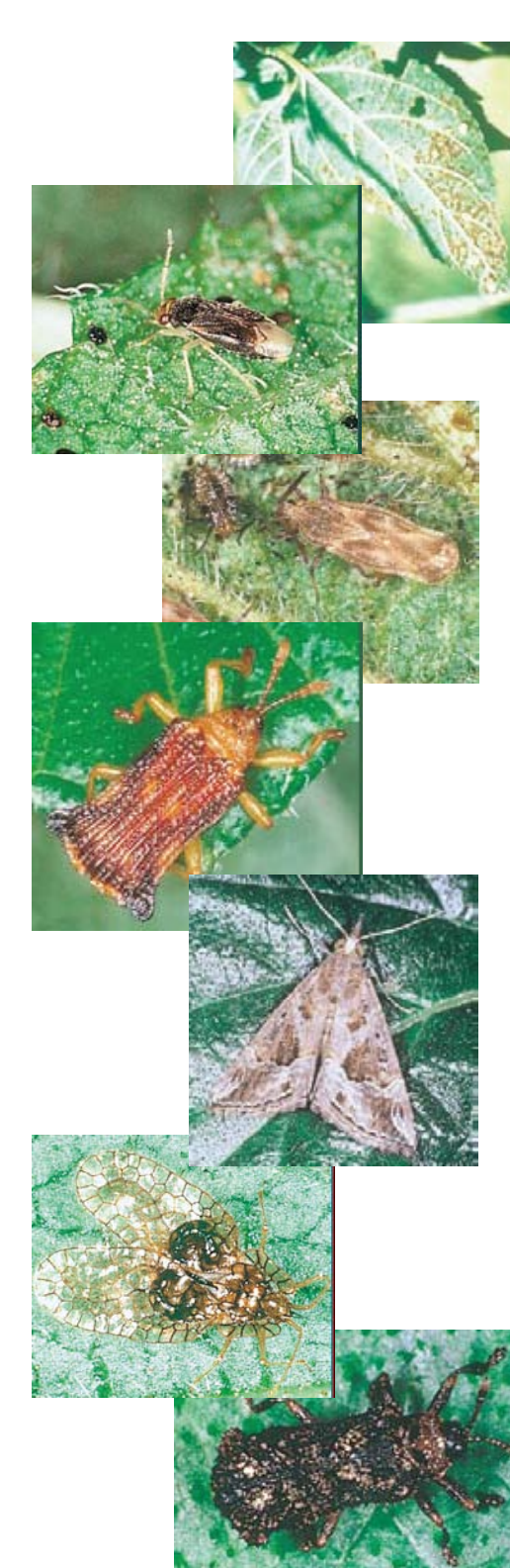
An ideal biocontrol agent for Australian weedy Lantana should be deployed by:

1. Collecting from a suitable source locality
2. Finding regions with similar ecological properties to the region to be targeted in Australia, and
3. Finding agents that are effective against target flower colours that are within the regions with similar ecological properties and are also within the suitable source locality.

Future application

These findings have further application:

- through the transfer of integrated methodologies to other weeds, and
- by identifying generic trends among weedy species for more effective control responses.



Control agent	FLOWER COLOUR				
	Pink	PER	Red	Orange	White
<i>Prospodium tuberculatum</i> (Rust)	+/-	-	-	-	-
<i>Falcoxia intermedia</i> (Leaf sucker)	-	+	+	+	+
<i>Teleonemia scrupulosa</i> (Leaf sucker)	~	+	+	+	+
<i>Uroplata fulvopustulata</i> (Leaf miner)	+	+	-	-	-
<i>Hypena laceratalis</i> (Leaf feeder)	+	+	+	-	+
<i>Leptobyrza decora</i> (Sap sucker)	+	+	-	-	-
<i>Octotoma championi</i> (Leaf miner)	+	+	-	-	-

+ Susceptible - Resistant

Different flower colours are susceptible or resistant to different biocontrol agents

The Taxonomy Research & Information Network (TRIN) – funded through the Commonwealth Environment Research Facilities (CERF) program – addresses critical taxonomic knowledge gaps in key Australian animal and plant groups important for effective environmental management. TRIN research outputs underpin efforts in biodiversity conservation and natural resource management.

www.taxonomy.org.au

