

## **Invasion of *Senecio inaequidens* and risks for honey and bee pollen in Aosta Valley (I)**

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South African ragwort (*Senecio inaequidens*) was first reported in Aosta Valley in 1990 and since then it spread widely in the region. Its leaves, stems and inflorescences contain high concentrations of pyrrolizidine alkaloids (PAs), natural toxins that can cause fatal intoxications. Humans are exposed to PAs by consumption of foods, including honey and pollen loads collected by bees.

Considering the risks to human health and the increasing diffusion of *S. inaequidens* in Aosta Valley, we aimed at: i) determine the content of PAs in honey and bee pollen; ii) investigate the role of *S. inaequidens* in contamination; iii) compare PAs content to the limits recommended by food safety authorities.

To address these challenges, we mapped the distribution of *S. inaequidens* in the middle part of Aosta Valley and collected 40 honey samples (30 from beehives in areas highly invaded by *S. inaequidens*, 10 from beehives in free or poorly colonized areas) and 9 bee pollen samples (coming from beehives in strongly invaded areas). All samples were analysed to determine the PAs content.

PAs were detected in 39 honey samples out of 40, their content ranging from 0.8 to 22.2  $\mu\text{g kg}^{-1}$  (mean=6.2 $\pm$ 5.4  $\mu\text{g kg}^{-1}$ ). PAs associated to *Senecio* genus (retrorsine, senecionine and seneciphylline) were identified in most of the samples (34 out of 40), representing 40% of total PAs; their content was higher in honeys from invaded areas than in those from free areas (3.2 $\pm$ 4.4 vs 0.4 $\pm$ 0.4  $\mu\text{g kg}^{-1}$ ;  $p=0.05$ ).

In pollen samples - all collected in invaded areas - PAs were always present, with high but very variable contents (from 60 to more than 40,000  $\mu\text{g kg}^{-1}$ ).

According to EFSA recommendations, PAs levels in these honeys do not pose a risk to human health, unlike those in pollens.

**Keywords:** *Senecio inaequidens*, pyrrolizidine alkaloids, honey.

# Invasion of *Senecio inaequidens* and risks for honey and bee pollen in Aosta Valley (I)



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## Introduction

In the last 30 years, South African ragwort (*Senecio inaequidens*) spread throughout Aosta Valley (North Western Alps - Italy).

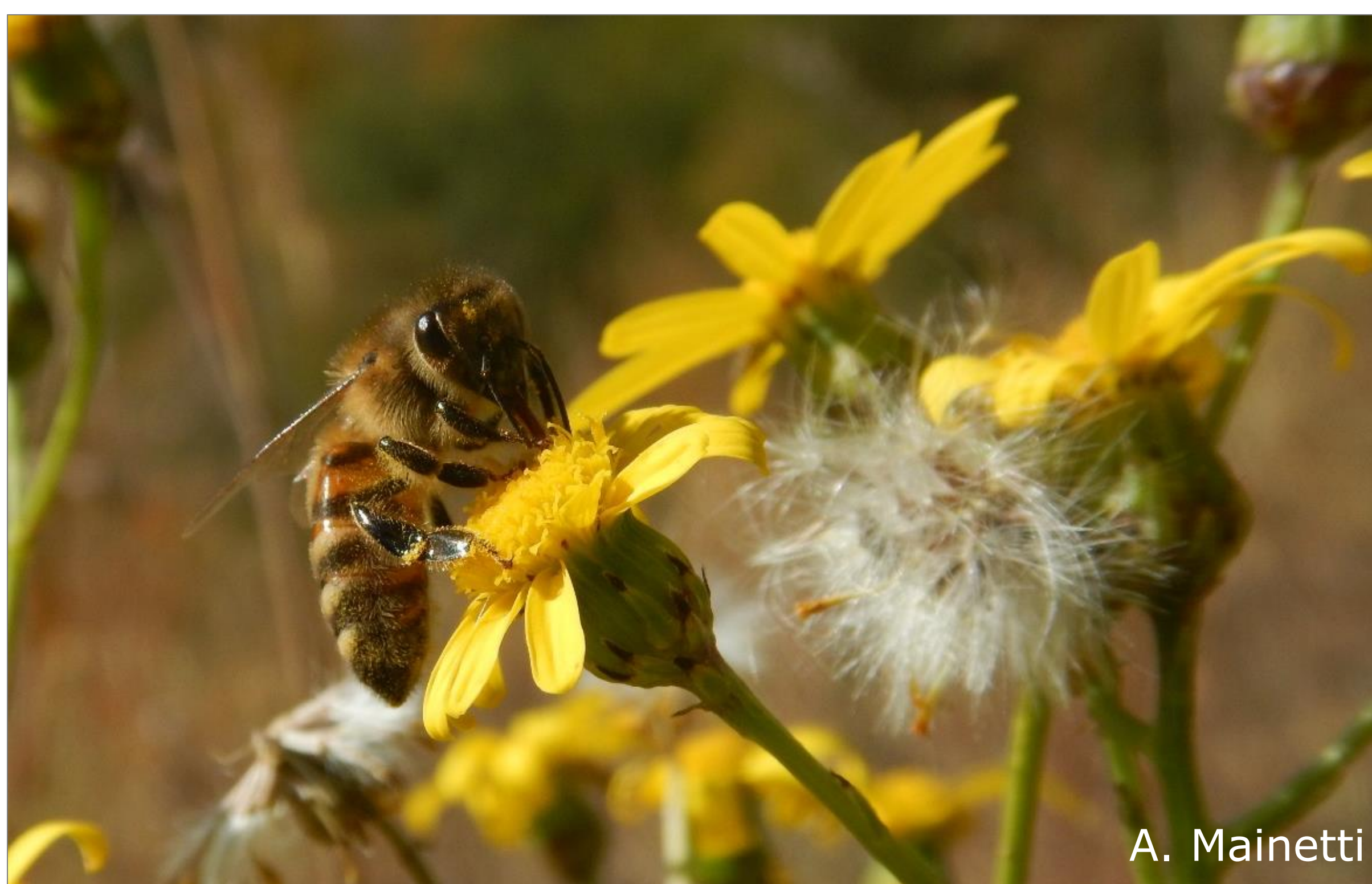
Its leaves, stems and inflorescences contain high concentrations of **pyrrolizidine alkaloids (PAs)**, which can cause fatal intoxications.

Humans are exposed to PAs by consumption of foods, including honey and pollen loads collected by bees.

## Aim

We aimed at:

- measuring the content of **PAs in honey and bee pollen**;
- assessing the role of *S. inaequidens* in contamination;
- comparing PAs content to the **limits** recommended by food safety authorities.



## Materials and methods

**Mapping of the distribution** of *S. inaequidens* in the middle part of Aosta Valley.

Measurement of **PAs content** in:

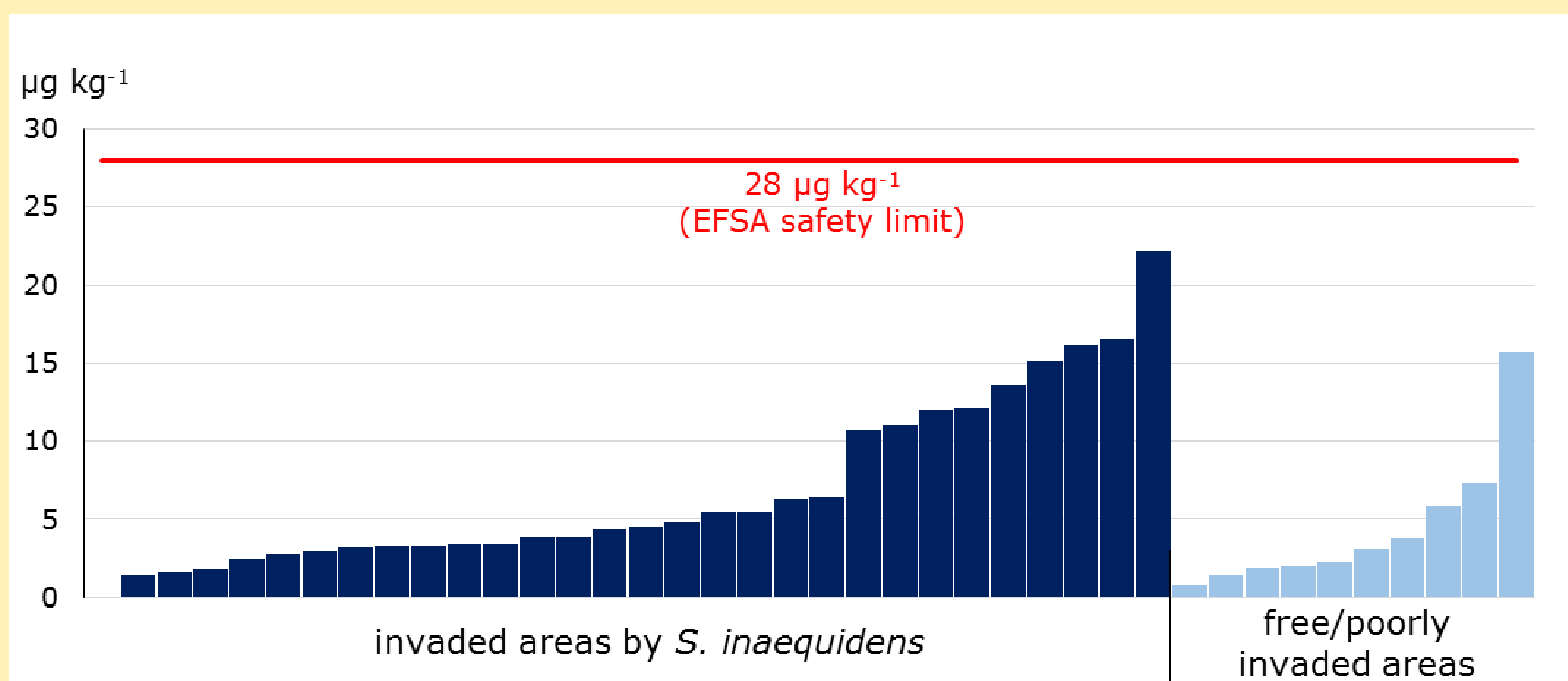
- **40 honey samples** (30 from beehives in areas highly invaded by *S. inaequidens*, 10 from beehives in poorly colonized areas);
- **9 bee pollen samples** (coming from beehives in strongly invaded areas).

## Results

### Honey

PAs were detected in **39** honey samples out of 40, their content ranging from **0.8 to 22.2**  $\mu\text{g kg}^{-1}$  (mean= $6.2 \pm 5.4$   $\mu\text{g kg}^{-1}$ ). PAs associated to *Senecio* genus (retrorsine, senecionine and seneciphylline) were identified in most of the samples (34 out of 40), representing **40%** of total PAs; their content was **higher** in honeys from **invaded areas** than in those from free areas ( $3.2 \pm 4.4$  vs  $0.4 \pm 0.4$   $\mu\text{g kg}^{-1}$ ;  $p=0.05$ ).

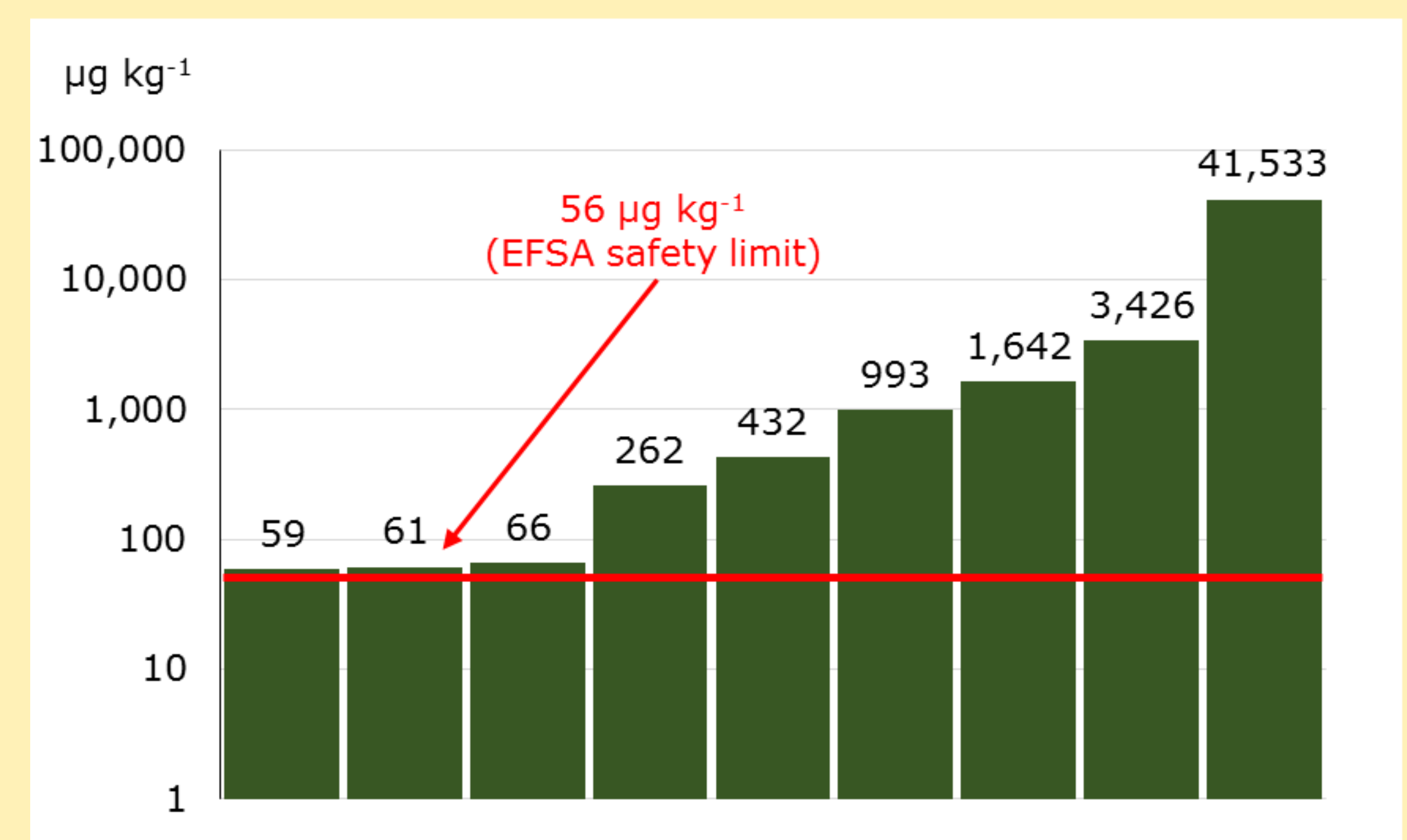
**PAs content in 40 honey samples** and comparison between *S. inaequidens* invaded areas and poorly colonized areas.



### Pollen

In pollen samples - all collected in invaded areas - PAs were **always present**, with **high** but very variable contents (from **60 to more than 40,000**  $\mu\text{g kg}^{-1}$ ).

**PAs (log) content in 9 pollen samples** coming from beehives in strongly invaded areas.



## Conclusions

According to EFSA recommendations, PAs levels in the **honeys** do not pose a risk to human health, unlike those in pollens. Bee-keepers interested in marketing **pollen** would better take it from apiaries placed in areas not infested by South African ragwort or submit it to toxicological analysis before sale.