MONITORING APHID POPULATION DYNAMICS AND SPECIES COMPOSITION IN SOUTH AFRICAN AGRICULTURE USING BUCKET AND SUCTION TRAPS

VAYLEN HLAKA[1], LIESCHEN DE VOS[1], BERNARD SLIPPERS[1], DAVID READ[1], KERSTIN KRUGER[2]

[1]Department of Biochemistry, Genetics and Microbiology, Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria 0002, South Africa

[2]Department of Zoology and Entomology, Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria 0002, South Africa

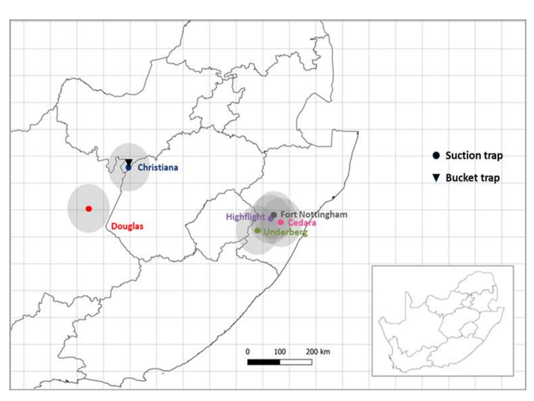
INTRODUCTION & AIM

Aphids (Hemiptera: Aphididae), which include over 5,500 species across 703 genera, are major agricultural pests. Known for their polyphagous feeding habits and role as vectors of plant viruses, they contribute significantly to crop damage [1]. Effective monitoring plays a crucial role in managing aphid populations and mitigating their impact. This study analyzes aphid monitoring data from 2006 to 2021, collected from Christiana and six national suction traps, to inform pest management strategies and enhance agricultural resilience.

MATERIALS & METHODS

OVERVIEW OF COX1 BARCODING WORKFLOW

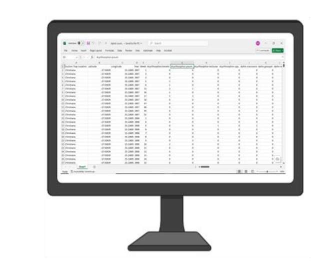
TWO TYPES OF TRAPS



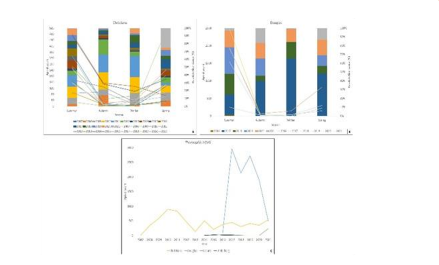
MAP OF STUDY AREAS

PRE-SORTING AND MORPHOLOGICAL IDENTIFICATION [2]

APHID DATA CURATION



DATA ANALYSIS



DATA VISUALIZATION

RESULTS &DISCUSSION

1. Species Composition and Abundance — Suction Traps

A total of 168,869 aphids from 68 species and 47 genera were recorded, with *Rhopalosiphum padi* (31.4%) being the most abundant. The pie chart (Figure 1A) shows the top 10 species captured by suction traps, reflecting the dominance of airborne aphids across sites.

2. Trap Type Comparison — Suction vs. Bucket

Although the top 10 species from both trap types accounted for 89.9% of total aphid abundance, species composition differed notably. Suction traps captured more aerial species like *R. padi*, while bucket traps, used during pilot trials in Christiana, sampled 31 species from 21 genera, targeting ground-level taxa such as *Tetraneura fusiformis*. A Venn diagram (Figure 1C) highlights overlapping and unique species — for example, *Aloephagus myersi* and *Sitobion africanum* were exclusive to bucket traps — reflecting differences in trap height and host plant proximity.

3. Seasonal Patterns — Suction Traps

Aphid abundance peaked in spring and autumn, with declines in summer and winter. Seasonal trends for *R. padi* in Underberg are shown in Figure 1D. Species varied: *Cinara spp.* and *Pemphigus spp.* peaked in spring and winter, *Aphis spp.* and *Therioaphis trifolii* in summer and autumn, while some, like *Hyalopterus pruni*, showed no clear seasonal trend.

4. Regional Differences — Suction Traps

Aphid abundance was higher at low-elevation sites (Christiana, Douglas, Highflight) than at high-elevation sites (Cedara, Underberg, Fort Nottingham), likely due to climatic and vegetation differences. This pattern was statistically significant (p = 0.0328) and is shown in the bar chart (Figure 1E).

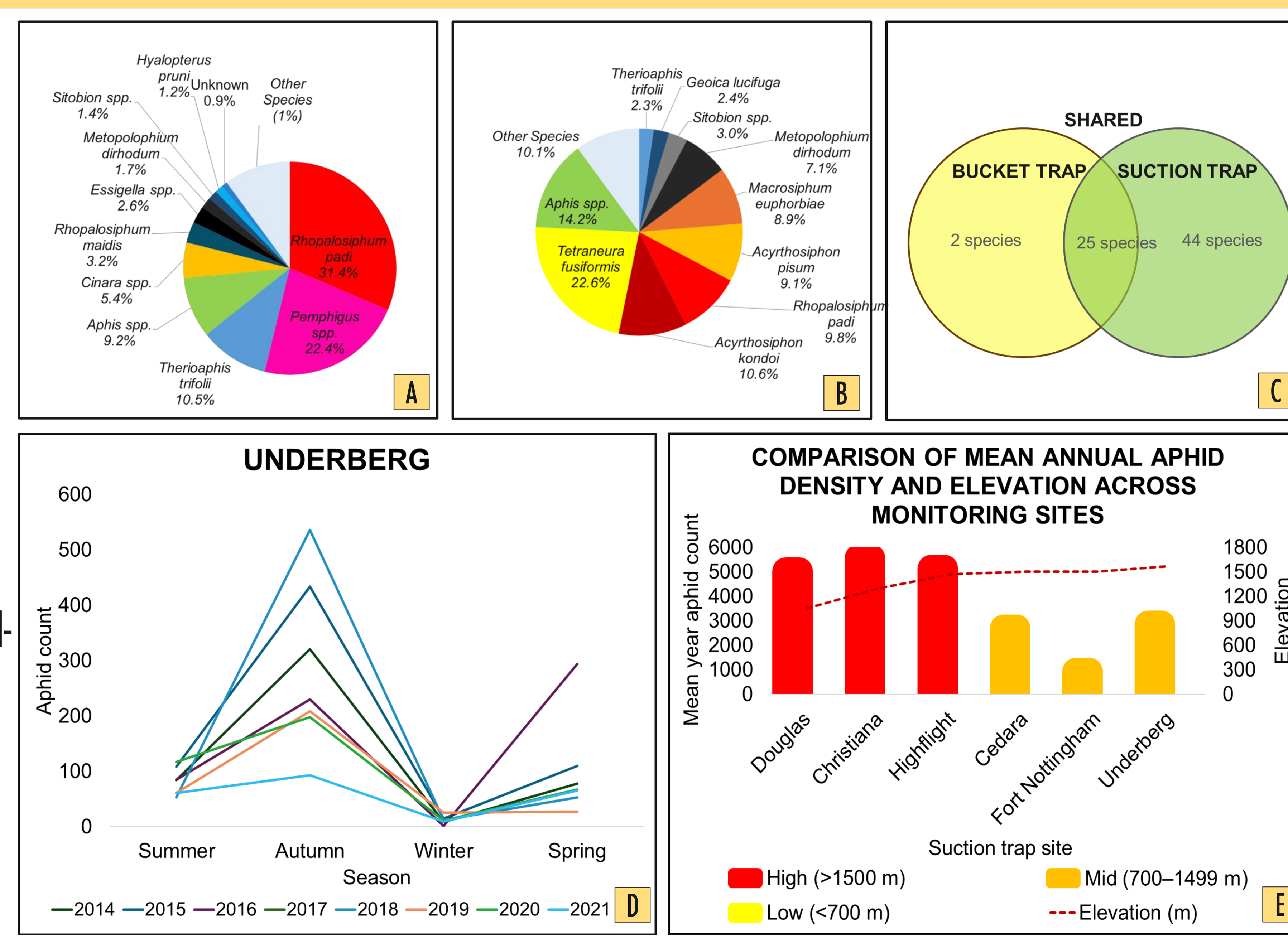


FIGURE 1. APHID POPULATION DYNAMICS AND TRAP COMPARISON

(A) Top 10 Species – Suction traps: Pie chart of the top species captured by suction traps.(B) Top 10 Species – Bucket traps: Pie chart of species from bucket traps, focusing on ground-level collection.(C) Trap overlap: Venn diagram of species shared and unique to each trap type, highlighting *Aloephagus myersi* and *Sitobion africanum* exclusive to bucket traps.(D) Seasonal Aphid Abundance – Suction traps: Line graph showing seasonal aphid trends, using Rhopalosiphum padi in Underberg.(E) Elevation vs. aphid abundance: Dual-axis chart showing mean annual aphid abundance and site elevation, grouped as low (<700 m), mid (700–1499 m), and high (≥1500 m), with statistical significance (p = 0.0328).

CONCLUSION

Suction traps revealed seasonal and regional variations, with R. padi dominant and higher abundance at low-elevation sites. Bucket traps captured additional ground-level species.

REFERENCES

1. Dedryver, C.A.; Le Ralec, A.; Fabre, F. The Conflicting Relationships between Aphids and Men: A Review of Aphid Damage and Control Strategies. C. R. Biol. 2010, 333, 539–553.

2. Millar, I.M. The Aphids (Homoptera: Aphidoidea) of South Africa. Entomol. Mem. S. Afr. Dep. Agric. Dev. 1990, 78, 1–105.