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Assessment of the Diversity and abundance of floral visitors of wild radish (*Raphanus raphanistrum L.*) in the

foothills agroecological zones of Lesotho.

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Introduction

Wild radish (*Raphanus raphanistrum* L.) as a leafy vegetable plays an ecological and economic role in Lesotho.

- It produces pollen and nectar, attracting a variety of insect visitors that contribute to food security and biodiversity.
- Understanding pollination helps improve conservation strategies and sustainable agriculture.
- The research helps in increasing the yield and economic value of wild radish as a food source.
- It addresses the need to assess the diversity and abundance of insect pollinators for wild radish,
- The role of pollinators in improving crop yield and supporting breeding programs for high-yielding varieties,



Introduction continue...

- And understanding how pollination processes can be optimized to support sustainable agriculture practices.
- Hence, the present study aims:
- 1. To assess the diversity and abundance of floral visitors to wild radish.
- 2. To identify key pollinators that contribute significantly to wild radish pollination.
- 3. To understand the role of pollinators in enhancing pollination efficiency.
- 4. To determine peak pollinator activity periods and their relationship with environmental factors.
- This study contribute to the development of sustainable agriculture practices by optimizing wild radish pollination strategies.





Materials and Methods

- Location: Nyakosoba, foothills agro-ecological zone of Lesotho (elevation: 2038.78 m).
- Climate Conditions: Peak flowering season (Dec 2022 Jan 2023), temperature range: 13.8°C -26.1°C.
- Habitat: The study area consists of approximately 100m² where wild radish was present. The site was bordered by lines of trees (apples and peaches) on both sides. Within this area, there were patches of wild flowers interspersed among the wild radish.
- Quadrat Placement: Four 1m × 1m quadrats were placed within a 100m² area, specifically in areas with the highest density of blooming wild radish.
- Sampling procedure: Observation time was in three time slots 9AM-11AM, 1PM-3PM, 4PM-6PM.
- Pollinators within the boundaries of each quadrat were observed and counted for 30 minutes.
- To assess diversity and abundance, insects on the flowers of Wild radish were captured using Sweep nets.
- Specimens were stored in ethyl acetate-filled tubes and later pinned in the collection boxes for identification.
- The identification was done with the help of Dino Capture 2.0 (Digital microscope), taxonomic literature, Google and Facebook.
- And visitation frequency was recorded as the number of visits made by pollinators to the flowers inside the quadrat.



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Data Analysis

- **Diversity:** The variety of species in a given area, including species richness and evenness.
- Abundance: The number of individuals of a particular species in a given area.
- Species diversity was assessed by looking at species richness (the number of present species).
- Pollinators abundance and abundance of pollinators based on their different visitation times were evaluated using Cross tabulation.
- Relative abundance was calculated as the numbers of individuals of a particular species captured relative to the total number of species in the area.
- ANOVA was conducted to examine differences in visitation frequency among pollinator species.





Results and Discussions

• Total insect species recorded were 24

with a sum of 229 individuals.

- The represented orders were:
- Diptera (Flies and Syrphid flies)
- Hymenoptera (Bees and Wasps),
- Lepidoptera and Coleoptera. similar to the findings of Divija *et al.* (2022), where they recorded Diptera,

Hymenoptera, and Lepidoptera as

Pollinators Diversity by Order In Nyakosoba.



■ Diptera ■ Hymenoptera ■ Lepidoptera ■ Coleoptera ■

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A BAR CHART SHOWING SPECIES ABUNDANCE

Pollinators Abundance in Nyakosoba



Visitors at different times of the day in Nyakosoba

Apis mellifera had peak visits at 1 PM making (16

visits), 12 visits at 9 AM and 9 visits at 4PM.

Musca domestica was also peak visiting at 1 PM making (9 visits)

Eristalis tenax made 9 visits in the morning 11 visits at 1 PM and 4 visits at 4 PM

Less frequent visitors were:

Xylocopa caffra

with one visit in the morning, 2 visits at 1PM and 0 visit at 4 PM.

Stomoxys calcitrans made 1 visit in the morning, 1



Order Species Apis mellifera Hymenoptera Eristalis tenax Diptera Musca Diptera domestica Stomoxys Diptera calcitrans *Xylocopa caffra* |Hymenoptera





Visitation frequency of different pollinator species on flowers of Wild radish.

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Species	Visitation frequency
	(Visits/flower/mins)
Eristalis tenax	0.63±0.50
Anthophora sp.	1.00±0.00
Apis mellifera	1.63±2.09
Stizus sp.	2.25±3.20
Musca domestica	1.00±0
Phytomia sp.	1.00±0
Simulium sp.	1.00±0

- The most frequent visitor was *Stizus sp.* followed by *Apis mellifera*.
- The smallest visitation frequency was recorded for *Eristalis tenax*.

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Key findings

- Frequent visitors enhance cross-pollination and genetic diversity.
- The consistent presence throughout the day ensures continuous pollen transfer, reducing reliance on any single pollinator species.
 - Increased pollinator activity supports ecosystem resilience,
 maintaining balanced interaction between crops and
 pollinators.
 - The peak activity period was linked to warmer
 temperatures at midday making pollinators more active for
 foraging and many plants release nectar and pollen during
 warmest part of the day attracting pollinators.

- The current study aligns with Divija *et al.* (2022) and Conner *et al.* (2007) in emphasizing pollinators' role in genetic diversity and ecological balance.
- Divija *et al.* (2022) focused on species-specific behaviours, while Conner *et al.* (2007) highlighted long-term evolutionary impacts.
- And the current research bridges both studies, showing how pollinator activity patterns directly impact both pollination success and genetic variation.



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Conclusion and Recommendations

- Apis Mellifera (honeybees), Eristalis tenax (Syrphid flies) and Stizus sp (wasps) are key pollinators to wild radish.
- High pollinator activity supports ecosystem resilience and enhances pollination efficiency.
- Implement conservation strategies to maintain pollinator diversity.
- Reduce pesticide use to support healthy pollinator populations.
- Further research should focus on pollination impact on seed quality by studying how different pollinators influence seed viability, germination rates, and plant vigor in breeding programs,



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