Comparative effects of different cabbage varieties on the bionomics of two aphid species (Hemiptera: Aphididae)

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INTRODUCTION

- *Lipaphis erysimi pseudobrassicae* (Davis) *and Myzus persicae* (Sulzer) are important pests of brassica crops, causing significant yield losses on cabbage in Ghana (Forchibe *et al*., 2017; Fening *et al*., 2020)
- Management of these pests in the country is largely dependent on conventional insecticides, which often lead to pest resistance, environmental pollution, food safety, and health issues (Bass *et al*., 2014).
- To inform the development of ecologically sound and sustainable pest management strategies for these pests, their biological and population growth parameters were studied on three cabbage varieties (Oxylus, Fortune, and Leadercross).

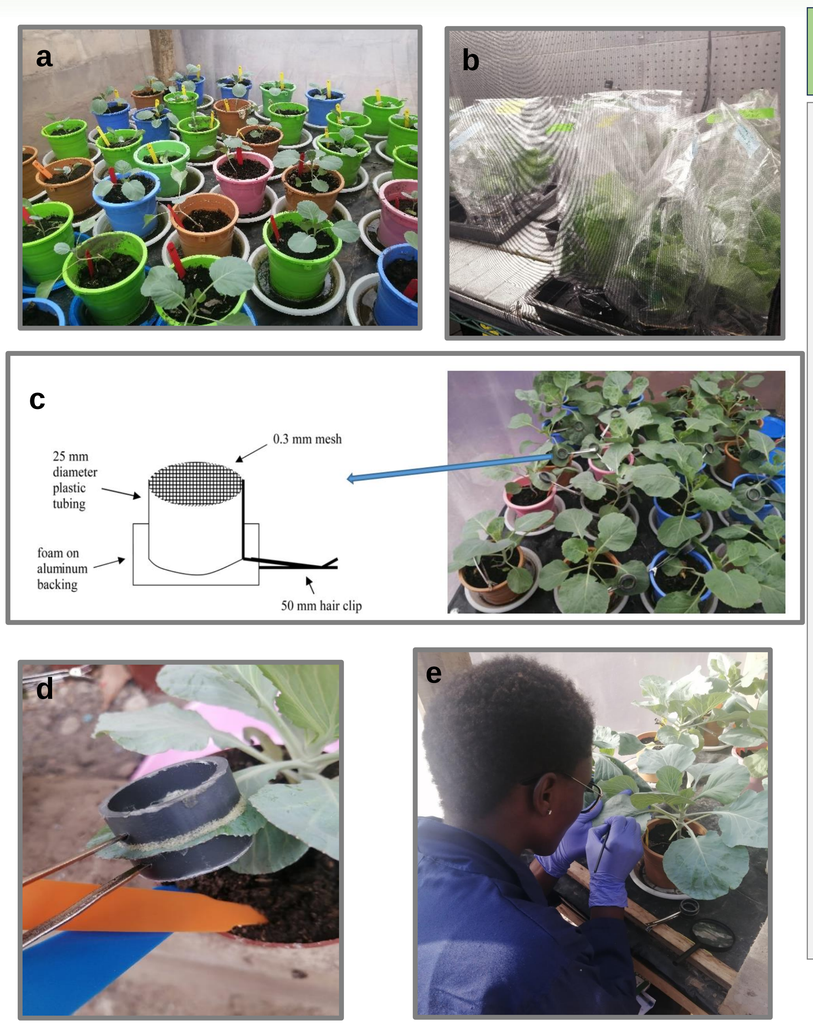

Figure 1. a) transplanted cabbage seedlings, b) aphids on potted Chinese cabbage, c) Aphids confined in clip cages for study d) close view of clip cage e)monitoring for various aspects of the bionomics

METHODS

- At the third leaf stage, seedlings were transplanted into 15 plastic pots/cabbage variety (12 x 12cm) (Fig. 1a)
- Aphids were collected from the field and reared on potted Chinese cabbage plants under net house conditions, covered with micro-perforated bread bags (Seal Packaging, Luton, UK) (Fig. 1b)
- Aphid was confined with a clip cage, 2 aphids per plant, and potted plants kept under net house conditions and monitored daily for the various aspects of the bionomics (Fig. 1c, d, e)
- **Statistical analysis**
  - Life table analysis- Female age-specific
  - Biological parameter – Kruskal Wallis test
  - Survival analysis – Kaplein Meier

RESULTS

Table 1. Mean growth stages duration of *L. e. pseudobrassicae* and on three cabbage varieties *M. persicae*

Aphid species	Parameters	Varieties/Duration (days)					
		n	Oxylus	n	Fortune	n	Leadercross
L. e. pseudobrassicae	Total nymphal duration		5.97 ± 0.13a		5.87 ± 0.37a		4.87 ± 0.43a
	Adult longevity	30	11.70 ± 1.04a	24	8.60± 0.97ab	16	5.23 ± 0.97b
	Reproductive period		10.57 ± 1.01a		7.70 ± 0.87ab		4.77 ± 0.87b
	Fecundity (nymphs/female)		44.77 ± 5.18a		31.27 ± 4.31a		12.97 ± 2.60b
	Total lifespan		17.67 ± 1.02a		14.47 ± 1.13a		10.10 ± 1.32b
M. persicae	Total nymphal duration		6.50 ± 0.13a		4.03 ± 0.67b		6.40 ± 0.56a
	Adult longevity	28	12.83 ± 1.20a	14	5.47 ± 1.24b	22	8.73 ± 1.08b
	Fecundity (nymphs/female)		31.27 ± 3.96a		7.67 ± 2.09b		14.13 ± 2.18b
	Total lifespan		19.33 ± 1.24a		9.50 ± 1.77b		15.13 ± 1.45a

- Both aphids had four nymphal stages on all three cabbage varieties.
- A significant variation in nymphal duration was recorded for *M. persicae* on Fortune and Oxylus (Table 1)
- Nymphal duration varied between both aphid species on all three varieties
- The reproductive period and adult longevity varied significantly among varieties for both aphid species, and between both aphids on some varieties (Table 1)
- A significant variation in the fecundity was recorded for both aphid species (Table 1, Fig. 4)

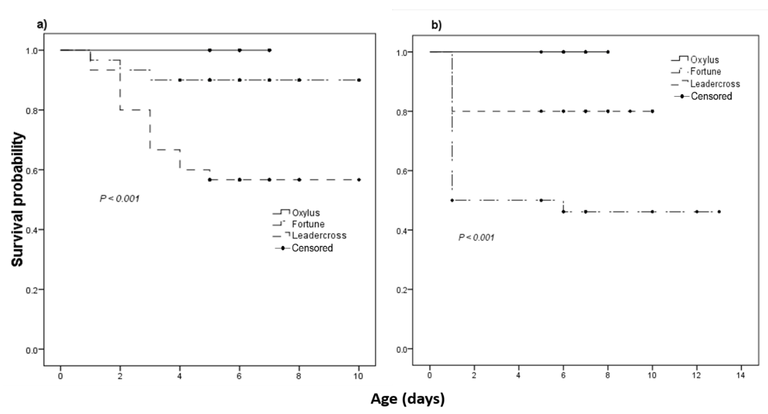

Figure 2. Kaplan–Meier nymphal survival curve for a) *Lipaphis erysimi pseudobrassicae* and b) *Myzus persicae* on three cabbage varieties.

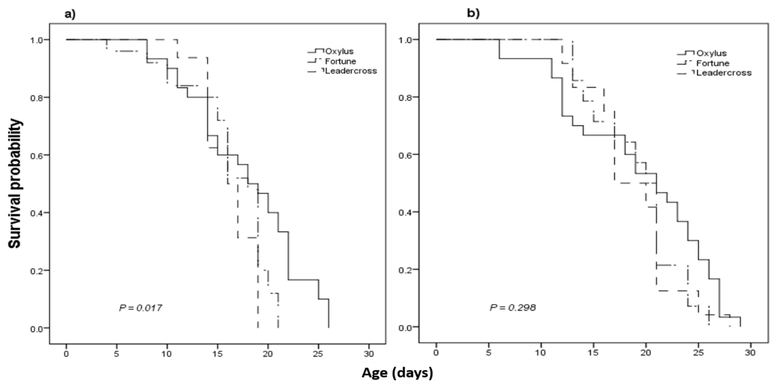

Figure 3. Kaplan–Meier adult survival curve for a) *Lipaphis erysimi pseudobrassicae* and b) *Myzus persicae* on three cabbage varieties.

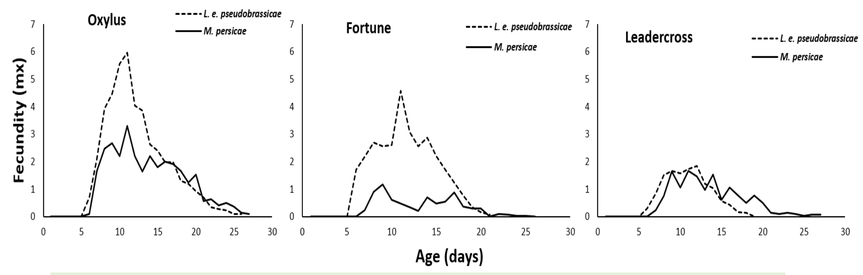

Figure 4. Age-specific fecundity (mx) of *Lipaphis erysimi pseudobrassicae* and *Myzus persicae* on three cabbage varieties

Table 2. Population growth parameters of *L. e. pseudobrassicae* and *M. persicae* on three cabbage varieties

Aphid species	Parameters	Varieties		
		Oxylus	Fortune	Leadercross
L. e. pseudobrassicae	R_0 (offspring/individual)	35.96 ± 2.66a	21.89 ± 1.77b	6.46 ± 0.58c
	r_m	0.31 ± 0.02a	0.28 ± 0.02a	0.17 ± 0.03b
	λ	1.37 ± 0.02a	1.32 ± 0.02a	1.19 ± 0.02b
	T	11.47 ± 0.38a	11.15 ± 0.43a	10.70 ± 0.42a
	DT	2.22 ± 0.66a	2.51 ± 0.69a	3.97 ± 1.37a
M. persicae	R_0 (offspring/individual)	23.75 ± 1.76a	2.94 ± 0.21b	9.61 ± 0.86c
	r_m	0.25 ± 0.03a	0.09 ± 0.02b	0.18 ± 0.03a
	λ	1.28 ± 0.03a	1.09 ± 0.02b	1.20 ± 0.03c
	T	12.74 ± 0.47a	12.23 ± 0.40a	12.49 ± 0.46a
	DT	2.79 ± 0.39a	7.87 ± 6.06b	3.83 ± 1.86a

- The nymphal survival rate of *L. e. pseudobrassicae* differed significantly among the three varieties (Fig. 2 and 3)
- Net reproductive rate of both *L. e. pseudobrassicae* and *M. persicae* were significantly higher on Oxylus compared to the other varieties (Table 2).
- Between *L. e pseudobrassicae* and *M. persicae* the R_0, r and λ varied significantly on Oxylus and Fortune varieties, while R_0 and T varied significantly on Leadercross variety

CONCLUSION

- Oxylus - most susceptible variety to both *L. e. pseudobrassicae* and *M. persicae*, while Leadercross - less susceptible to *L. e. pseudobrassicae* and Fortune to *M. persicae*
- Leadercross and Fortune- recommended to small-holder farmers as a cost-effective means to control aphids on cabbage
- However, they must be used in combination with or as a component of an integrated pest management strategy

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DAAD Deutscher Akademischer Austauschdienst German Academic Exchange Service