Parasitism of *Plutella xylostella* (L.)(Lepidoptera: *Plutellidae*) on kale (*Brassica oleracea* L. var. *acephala*) grown along with repellent and attractant companion plants

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Introduction

The demand for organically grown produce is rapidly increasing across the world as global communities are insisting more and more on protecting their health and environment.

According to Piñero & Manandhar, 2015 increasing plant diversity in agroecosystems is known to contribute to numerous ecological services, including regulation of insect pest densities through the activity of their natural enemies.

In this context the agricultural practice known as “Intercropping” has emerged as a promising way for enhancing pest control without reliance on chemical inputs such as pesticides.

The main objective of this study was to evaluate the potential of intercropping to influence the interactions between *Plutella xylostella* (one of the most economically important moth pests of cruciferous vegetables) and its parasitoid complex. This was achieved through habitat manipulation of the kale main crop with the use of repellent and attractant insectary plants.

Parker et al., 2013 give examples for repellent plants with some herbs and alliums which produce organic compounds of terpenes and release volatile fragrance into the air to repel pests from approaching crops. And Parolin et al., 2012 define attractant insectary plant as a flowering plant which attracts with its nectar and pollen resources a population of natural enemies, which can contribute to biological pest control.

Materials and methods

This experiment was conducted on University of forestry's experimental field from August to November 2024 on a pesticide-free area. The area is pointed out as suitable for urban agriculture in manicupality's official documentation and is located just at the end of the capital city of Sofia.

Kale seedlings from the cultivar "Nero di Toscana" were intercropped with 11 companion plants: *Lobularia maritima* (Sweet alyssum), *Borago officinalis* (Borage), *Fagopyrum esculentum* (Buckwheat), *Tropaeolum majus* (Nasturtium), *Calendula officinalis* (Pot marigold), *Tagetes patula* (French marigold), *Anethum graveolens* (Dill), *Coriandrum sativum* (Coriander), *Petroselinum crispum* (Parsley), *Ocimum basilicum* (Basil) and *Allium porrum* (Leeks).

Total number of 48 beds were created with 12 variants and 4 replications and they were randomised in a complete block design. The 4 blocks were spaced 3 m apart and between the beds there were 1 m wide pathways. Each seed bed was 1,2 m x 4,2 m in size with 3 rows of companion plants and two rows of kale seedlings between them.

Materials and methods

The 4 replications of all variants were examined 3 times in the data collecting period, with 2-3 weeks between observations. The number of kale plants in one bed was 14, but only 10 plants per bed were examined.

Each kale leaf was carefully searched for P. xylostella larvae and pupae in loose silk coccoons, which were hand picked and collected in 2 ml self-lock sterile plastic tubes. They were later transferred to 250 ml plastic containers with breathable cloth on top, supported with a rubber band.

Pupae were separated and were waited to become adult moths, while larvae were placed in cups with fresh kale leaves. The goal was to rear them long enough to see if a parasitoid would hatch out of them.

Materials and methods

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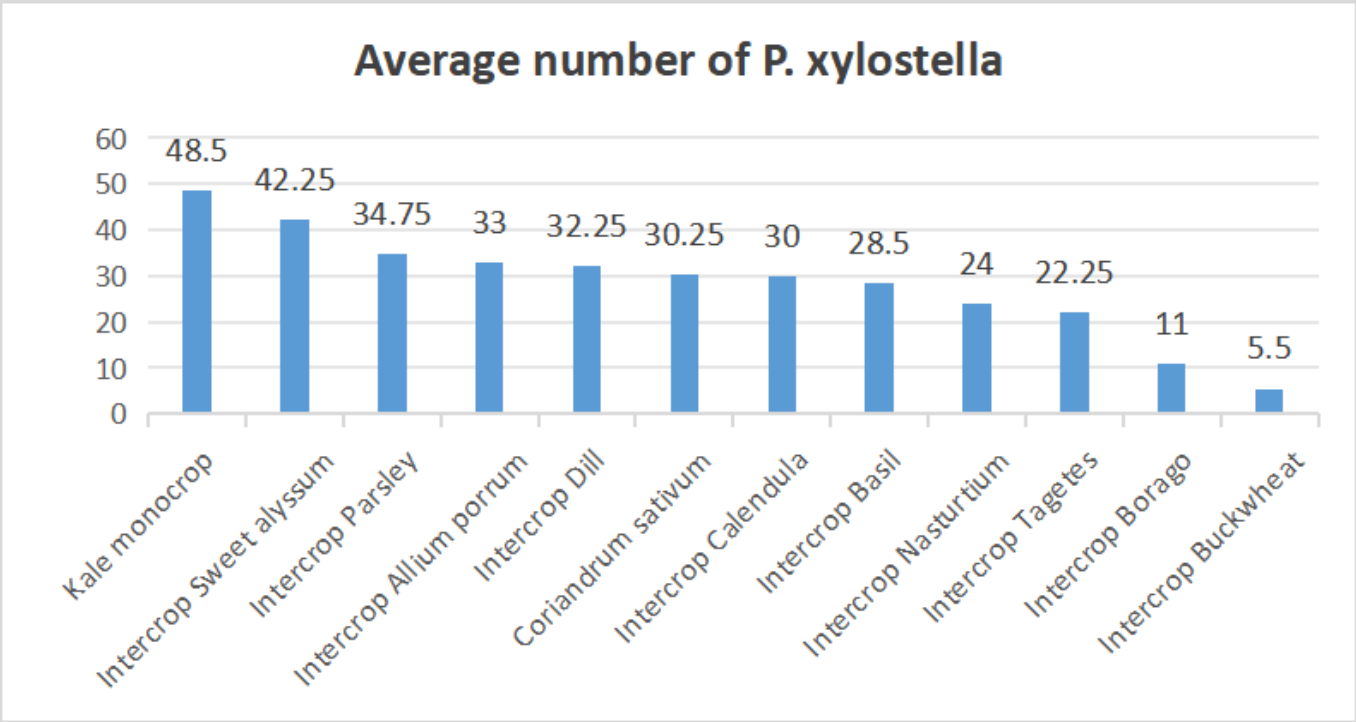
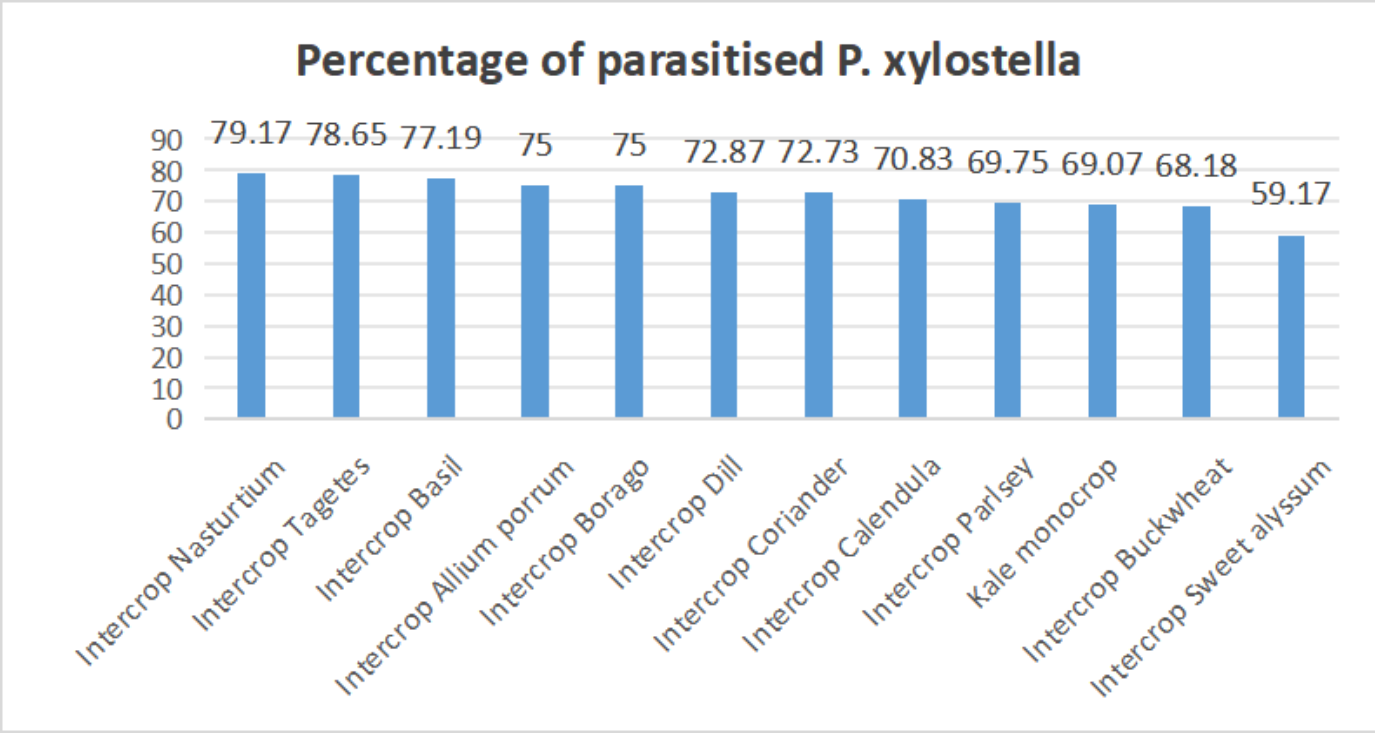
(www.wiki.bugwood.org)

Results and discussions



The intercrop of Kale with Buckwheat, Borago, Nasturtium, Tagetes and Basil had the least amount of average numbers of P. xylostella larvae. It should be pointed out that Borago and Buckwheat plants grew much faster and taller than kale plants and acted as a physical barier against the pest. So this role should also be taken in account when evaluating their repellent potential. As for Nasturtium, Tagetes and Basil, the results show that they are one of the least preferred host plants for the pest.

Results and discussions



The intercrop of Kale with Nasturtium, Tagetes and Basil showed the highest parasitism rates. It should be pointed out that only Nasturtium and Tagetes were in bloom through the data collecting period. Basil, which produces organic volatile compounds and is considered as a repellent plant, does not seem to have repellent effect on parasitoid wasps and in fact attracts them, even though it did not offer pollen or nectar resources.

Conclusions and recommendations

- The data presented in this study supports the original hypothesis that intercropping kale with herbs and flowers in an organic policulture system increases the attraction of parasitoid natural enemies of P. xylostella.
- Parasitism rates of the pest's larvae ranged from 50% to 80%, suggesting that intercropping can serve as a viable and sustainable pest management strategy for small-scale urban vegetable production.
- Results suggest that not only flowers, but herbs as well can be succesfully grown as insectary plants for vegetables from the family Brasicaceae. They can propose not only pollen and nectar, but shelter and breeding sites to natural enemies as well. This way of supporting beneficial insects helps to increase their abundance and fecundity and their role in biological control.
- This experiment will be repeated for two more years, so more data will be gathered and used to clarify tendencies in results. The long-term nature of biological control experiments is needed and scientifically-sound studies on companion plants are the best way to fill the gaps in this field of knowledge.

References

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Thank you for your attention!

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