

zide and Triasulfuron were relatively safe to adults of *Trichogramma cacociae*. The study also includes testing the side effects of some insecticides on two predators at small scale level at the Gezira Research Farm, Wad Medani. The results indicated that Diafenthiuron was relatively safe to the predatory beetle *Cheilomenes propinqua vicina*.

### Conclusion

The result showed that some pesticides can be used selectively to safe important natural enemies attacking agricultural insect pest and hence help in conserving these important natural resources.

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### Unkrautbekämpfung durch Samenprädatoren

*Weed control by granivores*

A growing number of studies indicate that post-dispersal losses of weed seeds in arable fields can be substantial. Seed bank studies show that 70 to 99 % of the seeds produced in a standing crop do not emerge as seedlings in subsequent crops, nor can they be recovered from the soil. Losses of this magnitude can have a substantial impact on weed population dynamics and contribute to the long-term suppression of annual weeds. A large part of these losses can be attributed to seed predation.

Very diverse groups of animals are known to consume seeds, including vertebrates (birds and rodents) and invertebrates (slugs, ants, ground beetles, crickets). In arable farming systems, mice, ants, and ground beetles are usually the main granivores. Both the activity of the granivores and the intensity of seed rain by weeds are variable over time and in space. A temporal or spatial mismatch between the two could lead to a lower proportion of seeds consumed than potentially possible. Understanding the factors that limit the numbers and activity of granivores and weed phenology could help to design measures that farmers could consider to stimulate granivory and, thus, natural weed control. Two sources of variation, namely habitat quality and weed flora composition, are discussed and their impact on seed predation rate is illustrated by examples.

Factors influencing habitat quality, for example, crop type, crop canopy cover and crop management practices, may affect seed predation rate. The influence of crop type and canopy cover is illustrated with a study conducted in Iowa, USA. Removal of weed seeds was measured in maize (N = 12), soyabean (N = 12), triticale under sown with lucerne or red clover (N = 8), and lucerne (N = 4) during 27 sampling periods. Seasonal patterns in seed predation appeared crop-specific. In maize and soyabean, seed predation was low in spring, high in summer and low in autumn. In triticale–legume intercrops, seed predation was high in spring, low in summer and moderate in autumn. In lucerne, seed predation fluctuated from high to low, matching the periodic harvest and regrowth cycle of the crop. Seed removal rates were correlated with crop canopy light interception (HEGGENSTALLER et al., 2006). The influence of crop management is illustrated with a study conducted in cereals in semi-arid NE-Spain. Seed removal was monitored in irrigated fields (N = 3), rain-fed fields that had a history of yearly tillage (N = 3), and rain-fed fields with a history of no-till. Seed removal was measured during multiple sampling periods. Tillage resulted in a reduction of seed removal rates as compared with no-till, while irrigation prevented seed removal (BARAIBAR et al., 2009). Another source of variation is the composition of the weed flora. The influence of seed preference and timing of seed shed is illustrated with a study conducted in the Netherlands. Removal of seeds of *Stellaria media* (L.) Vill., *Chenopodium album* L. or *Avena fatua* L., as well as weed seed production, were measured during multiple sampling periods in organic cereal fields (N = 4). There were clear preferences, but these differed between fields and changed over time. The pattern of seed removal was crop-specific, but that of seed shed was weed-specific, there was a good overlap in the timing of seed shed and the timing of seed removal for some weed species, resulting in high seed losses, but there was a temporal mismatch for other species, resulting in much lower losses (WESTERMAN et al., 2003).

These studies show that some factors influencing seed removal by granivores can be influenced by management, and thus amenable for manipulation, and others cannot.

#### Literatur

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