Value assessment of flower strips for bees and biodiversity

Flower strips have become more common along roads and field edges. They provide food and cover opportunities for game and insects. But do bees have favorite flower strips and what flower mixtures create the most value for the insects? This is unveiled in this article.

In recent years, colorful flower strips and set-a-side fields with flowers have become more common initiatives in the arable land. This is partly due to a growing awareness that flower-visiting insects have declined. Wild pollinating insects are an important part of the biodiversity of arable land. In addition, pollinators contribute to increased seed production in insect-pollinated crops such as oil seed rape and clover, as well as wild plants - and thus also a diverse flora.

Bee's favorite dish and flower continuity

Many studies show that we should focus more on composing seed mixtures so that flower strips can form the food basis for a diversity of insects. There is a difference in which plants honey bees, solitary bees, short-tongued bumble bees and long-tongued bumble bees prefer. This knowledge can be used more in the development of flower seed mixtures. Clover in flower mixtures benefit bumble bees and honey bees, but clover supports other groups of pollinators to a lesser extent. Many solitary bees prefer easily accessible flowers, e.g. from the Asteraceae (daisy, sunflower) and the Umbellifers (carrot, parsley) plant family.

In general, both the diversity and the number of bees in flower strips increase with the number of plant species in the seed mixture. A seed mixture with many species typically gives a longer and more coherent flowering period in the flower strip.

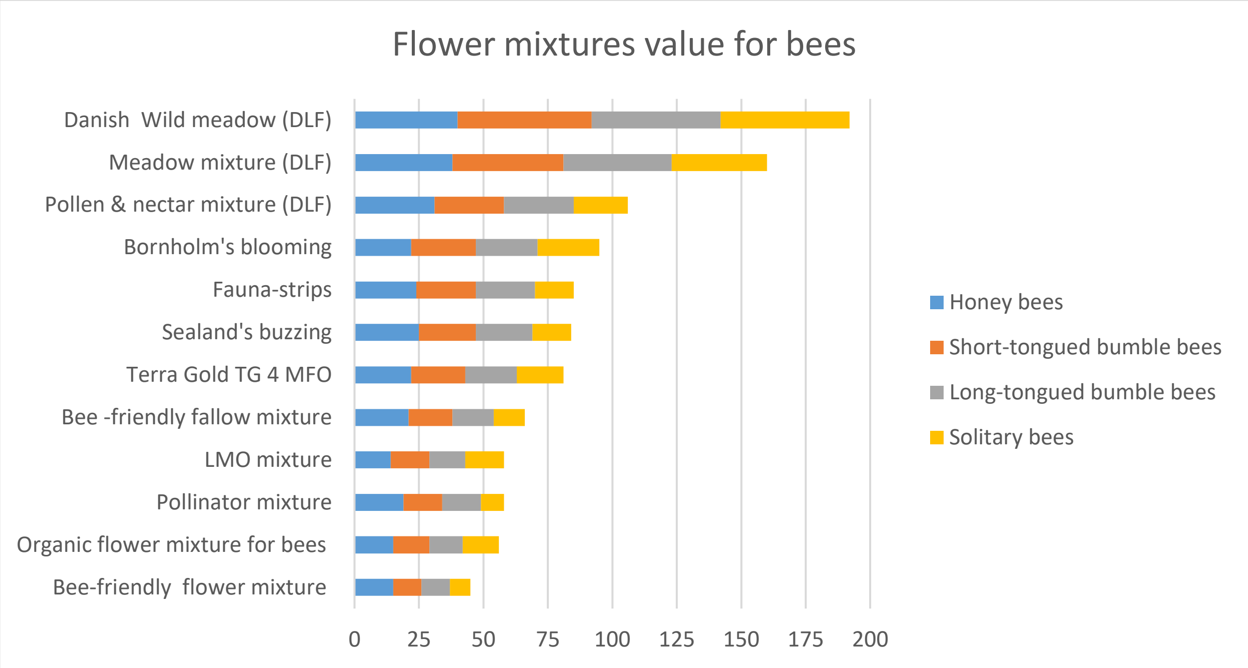
Study of the value of seed mixtures for bees

Scientists have assessed the value of 12 different seed mixtures for each of four groups of bees (honey bees, solitary (non-social) bees, short-tongued bumble bees and long-tongued bumble bees. For each group of bees, each plant was ranked from 0 (no value) to 3 (high value) based on observations of how often the bees visit the flowers of a given plant (source: Kirk & Howes, the Plant Book, 2012) A seed mixture value for a given group of bees was then calculated as the total number of points for all species included in the mixture, see Figure 1.

The value of plant species for bees

The composition of the 12 seed mixtures varied from six to 28 species with an average of 13 species. In general, the seed mixtures with the most species had the highest overall value for all bees, and most seed mixtures catered especially to honey bees and bumble bees rather than solitary (non-social) wild bees. Several seed mixtures contained many of the same plant species, and five seed mixtures contained 80-

100% of the plant species from other seed mixtures. Out of a total of 78 different plant species, 45 species (58%) were included in only one mixture, 16 species (20%) were included in two mixtures, five species (6%) in three mixtures and the remaining 11 species (14%) was included in 4-8 different seed mixtures. The 11 most popular species were phacelia, buckwheat, birdsfoot trefoil, flax, white clover, borage, cornflower, marigold, red clover, crimson clover and chicory.
The flowering period of the seed mixtures ranged from April to October. Across all seed mixtures, the number of potentially flowering species increased until July, after which the number decreased. Seed mixtures with many species generally had several potentially flowering species in each month.



Perspectives for the composition of seed mixtures
The categorization system used in this study provides new possibilities for composing seed mixtures with a more objective starting point. It can potentially be used to optimize seed mixtures as a feeding resource for bees. The categorization system can also be used to compose seed mixtures, which are targeted at specific groups of pollinators. For example, a seed mixture can be formulated so that it primarily supports the diverse group of solitary bees or honey bees - or long-tongued bumble bees, if the purpose is to create better conditions for pollinators that are especially important for red clover fields.

Possibilities and limitations of flower strips
The increase in flower resources is a recognized tool to support bees in the arable landscape. Nevertheless, it is essential to have an understanding of how much flower strips actually benefit biodiversity, and on what scale biodiversity should be understood in this context.
Flower strips established in intensively cultivated areas support in particular common species of bees, and to a lesser extent red-listed species. The fact that flower strips are not considered particularly effective in supporting threatened species and biodiversity in general does not mean that flower strips should be depreciated as a tool. It simply emphasizes the importance of being aware of what the purpose is, as well as having a tool to put compose flower strips for the desired purpose.
One purpose may be to use the flower strips to potentially increase the yield of insect-pollinated crops. Another purpose may be to increase the availability of flower resources for wild bees and insects in the area, both honey bees and wild bees, rare as well as common.

Flower strips are a supplement to greater biodiversity

Flower strips should be established in the cultivation area, and not replace uncultivated semi-natural areas, as growing flower strips can impair the quality of an otherwise permanent habitat for natural flora and fauna. There is a broad professional agreement that the diversity of both wild bees and all other insects is best taken care of by protecting existing wild habitats as the first priority, as permanently uncultivated areas generally house the greatest variation in habitats and thus different plant and animal species. Thereafter, stable contiguous populations can be encouraged by establishing and preserving dispersal corridors between natural areas and establishing perennial flower strips. Flower strips can to a greater extent be regarded as an additional supplement to creating diversity in the landscape rather than a targeted initiative to preserve biodiversity.

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Four groups of bees, which differ in size and length of tongue, and thus food choice and function as pollinators: (a) Honey bee (Apis mellifera), on white clover, (b) short-tongued bumble bee, here Red-tailed bumble bee (Bombus lapidarius) on birdsfoot trefoil, (c) long-tongued bumble bee, here Common carder bumble bee (Bombus pascuorum) on alfalfa, (d) solitary bee, here Large Scabious Mining bee (Andrena hattorfiana) on field scabious. Photos: Yoko L. Dupont