SORGHUM COMBINED WITH FLOWERING SUBSOILS

In the research project ‚Sorghum-Blühmischungen für einen insektenfreundlichen Energiepflanzenanbau‘ (engl.: Sorghum flowering mixtures for insect-friendly energy crop cultivation), sorghum was combined as a cover crop with various undersown crops. The results of the project are presented below.

Sorghum pollen is used by honey bees as a protein-rich food for the wintering bees. They hatch in the autumn when there is not much to collect. Their main task is to get the colony through the winter. Sorghum also benefits from these bee visits: If the weather is too cool or too hot, pollen production and therefore wind pollination is reduced, so the bee visits help with this task.

Sorghum profile

Sorghum is characterised by its diversity of varieties and uses. There are low varieties optimised for grain threshing, biomass varieties over four metres high and the relatively new dual-type hybrids. These grow to a height of between 1.5 and 2.5 metres and have a high grain content, which distinguishes them from the pure biomass types. During periods of low rainfall, sorghum takes a break from growing and is therefore

The flowering plants serve as a food supplement for honeybees and other flower visitors, in addition to sorghum pollen.

80 different undersown species or mixtures and mixture partners were tested in the research project 'Sorghum-Blühmischungen für einen insektenfreundlichen Energiepflanzenanbau' (engl.: Sorghum flowering mixtures for insect-friendly energy crop cultivation).

generally known to be drought tolerant. It also roots significantly deeper than maize on suitable sites, thus meaning it can draw water from deeper layers of soil.

Project setup

The research project is funded by the Justus Liebig University Giessen - Department of Plant Breeding, which has decades of experience in sorghum breeding. The Kirchhain Bee Institute of the Hessian State Agricultural Institute is responsible for extensive trials on the effects of undersown crops on bee colonies in flight tents and in the open landscape, and is evaluating flower visitors in all trial variants. Deutsche Saatveredelung AG provides the seed for shade-resistant clover varieties and undersown mixtures. Technical production trials, for example on sowing densities, row distances and staggered sowing times are being carried out by the Technology and Promotion Centre (TFZ), which has been advising on sorghum cultivation in Bavaria for many years. The project is funded by the German Federal Ministry of Food and Agriculture through the Agency for Renewable Resources and will run from May 2020 to the end of 2023.

Goals

The aim of the project is to find successful combinations of sorghum dual-type hybrids with insect-friendly energy crops and mix partners for higher environmental value in energy crop production.

The flowering plants provide honey bees and other flower visitors a food supplement in addition to sorghum pollen. To achieve this, the project tested more than 80 different undersown species or undersown mixtures as well as mixture partners. Production techniques such as seed mixtures with sorghum or staggered sowing were used to optimise intercropping, and attempts were made to extend the flowering period as long as possible.

Results

In the third year of the project, suitable combinations yielded the same as pure sorghum. The mixture of sorghum and sunflower was judged to be very good because of its flowering effect. Initially, many undersown crops grew too lush and suppressed the sorghum. Other species were excluded because they flowered too early or had too short a flowering period. Reducing the seeding rates of the undersown crops popular with flower visitors helped to reduce competition.

Weed infestation was also a problem in the trials. A staggered second sowing for the undersown crops provided additional protection for the sorghum yield by effectively eliminating competition. However, only vigorous undersown crops, such as buckwheat, flowered to the desired insect-promoting effect because they were in permanent shade. This method also increases labour costs. It is therefore advisable to sow a conventional seed mix including sorghum. If there is a foreseeable need for weed control, sowing should be in a wide row so that it can be mechanically hoed. In addition, sowing at grain spacing has proved effective for rapid row closure. The addition of soybean meal protects the seed mix against segregation.

Conclusion for farmers

When growing undersown or mixed crops one must find a compromise between the flowering effect for ecological benefits and not too much competition for reliable yields. Phacelia, buckwheat, sunflower, Persian clover and vining pea have been favourably evaluated. It is important to note that even very low seed rates are sufficient for a flowering effect, for example only 2,000 sunflower seeds per hectare. In the case of sorghum, a flowering period of several weeks was observed. Unfortunately, no positive effects on yield or substrate quality were found. It is particularly important for biogas farms that legume undersown crops such as clover and peas do not increase Nmin values after harvest. However, their seeding rate was too low for nitrogen fixation.

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