

## Screening Non Legume Species for Use as Cover Crop in Mixtures

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### Abstract

Several non-legume species have been tested for their suitability as cover crops, especially as constituent of mixtures with common vetch (*Vicia sativa*) and subterranean clover (*Trifolium subterraneum*) in field trials performed in southern Germany from 2013 to 2016. We present selected results. The highest amounts of biomass were produced by *Glebionis segetum*, *Anethum graveolens* and *Borago officinalis*, which were also able to compete with subterranean clover and common vetch. All other tested species produced less biomass than the two legume species and were outcompeted in mixtures.

### Introduction and objectives

Aim of the screening was, to identify new non-legume species to be used in mixtures with legumes as cover crops or in living mulches. In order to enhance diversity within the rotation, we focused on plant families not related to the usual crop species.

### Methods

The following species have been chosen for the screening: *Anethum graveolens*, *Barbarea vulgaris*, *Berteroa incana*, *Borago officinalis*, *Calendula arvensis*, *Calendula officinalis*, *Centaurea jacea* ssp., *angustifolia*, *Centaurea jacea* ssp.*jacea*, *Centaurea scabiosa*, *Chaerophyllum aureum*, *Chenopodium bonus-henricus*, *Chrysanthemum segetum*, *Guizotia abyssinica*, *Malva sylvestris*, *Melampyrum arvensis*, *Oenothera biennis*, *Papaver dubium*, *Papaver rhoeas*, *Pastinaca sativa*, *Pimpinella major*, *Plantago lanceolata*, *Plantago major*, *Plantago media*, *Raphanus raphanistrum*, *Reseda lutea*, *Salvia pratensis*. *Avena sativa*, *Brassica napus*, *Fagopyrum esculentum* and *Phacelia tenacetifolia* were included as control. The species were tested over three years: in 2014, all species were tested in small unreplicated plots; in 2015 and 2016, the most promising species were tested in replicated plots (4 replications) in addition in mixture with subterranean clover and spring vetch. Ground cover, biomass of both components at anthesis, and weed suppression were assessed. Selected species were grown in mixture with *Vicia villosa* (an Italian ecotype) and *Trifolium subterraneum* cv. „Campeda“ in replicated plots.

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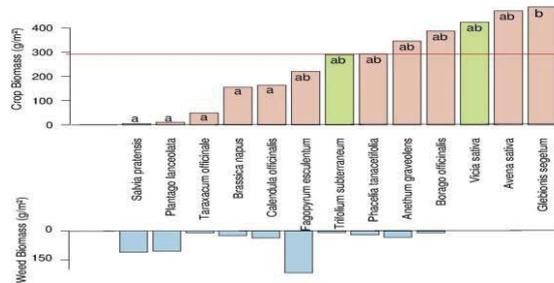
**Results and discussion**

We report results from 2015 (spring seeded). Quickly developing species with high biomass production proved to be *Glebionis segetum*, *Borago officinalis* and *Anethum graveolens* (Fig. 1). Especially *G. segetum* is surprising in biomass production.

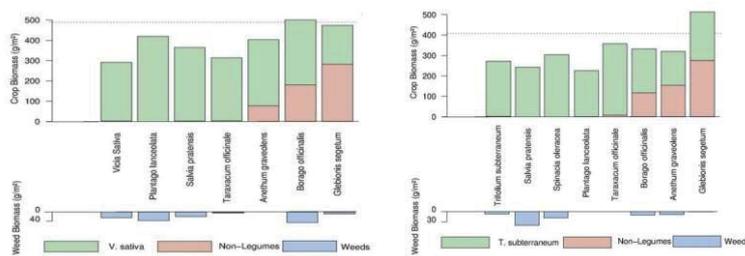
All these species suppressed weeds almost completely. Beside *Anethum graveolens*, the initial development was very fast in these species, which contributes to weed suppression. Despite a relatively slow establishment, *Anethum graveolens* was similarly competitive against weeds; allelopathic effects may play a role here. (Fig. 1)

Competition in mixtures with legume subsidiary crops is shown in Fig. 2. While several species were outcompeted completely both by summer vetch and subterranean clover, there was a good equilibrium between legumes and *Borago officinalis*, *Glebionis segetum* and *Anethum graveolens*, respectively.

A few species produced well-balanced mixed canopies with *Vicia sativa* and *Trifolium subterraneum* and therefore may be considered of interest as component of cover crop mixtures. The most interesting species is *Glebionis segetum*, (better known as *Chrysanthemum segetum*). *B. officinalis* developed also a very high biomass; moreover its early development was the fastest of all species comprised in the screening. However, seed shattering and unequal ripening makes seed production difficult and increases the risk of involuntary dissemination.



**Figure 1: Biomass production of non-legume species and Weed biomass (g/m<sup>2</sup>) measured in the respective plots.**



**Figure 2: Crop and wheat biomass (g/m<sup>2</sup>) in mixtures of selected non-legume species with subterranean clover and hairy vetch.**

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