

## **Effect of Seeding Date of Wheat and Clover Plant Interactions in Cereal Systems with an Associated Cover Crop**

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### **Abstract**

*The success of the establishment of living mulch systems in cereals is, among other factors, dependent on the seeding time both of the main crop and the associated crop, which may be planted together or at different seeding times. In this contribution, the results of a series of experiments are summarized, where both the absolute and the relative seeding time of winter wheat as main crop and subterranean clover as associated crop has been varied. Early seeding favored the clover, later seeding the main crop. Competition can be regulated by anticipating the seeding time of one of the components. However, an equilibrated mixed canopy could be obtained by seeding both components together.*

### **Introduction and objectives**

Associated crops (living mulches) may improve the sustainability of cropping systems, but competition by the associated crop often reduces among many other factors, competition by an associated crop (living mulch) is influenced by the seeding time. Aim of the studies presented in this contribution was, to investigate the effect of seeding time on the competition between wheat and subterranean clover associated as living mulch.

### **Methods**

Two series of experiments were performed at Freising (upper Bavaria, Germany) between 2013 and 2015, varying both the absolute and the relative seeding time of both components: (i) Experiments with wheat as main crop and subterranean clover as living mulch, planted together at 10 different seeding dates, ranging from the beginning of September to the end of October. (ii) Strip-plot experiments, which allow to compare different combinations of seeding time of living mulch and main crop, comprising controls with the living mulch and the main crops alone. Seeding dates ranged here from mid-September to mid-October.

### **Results and discussion**

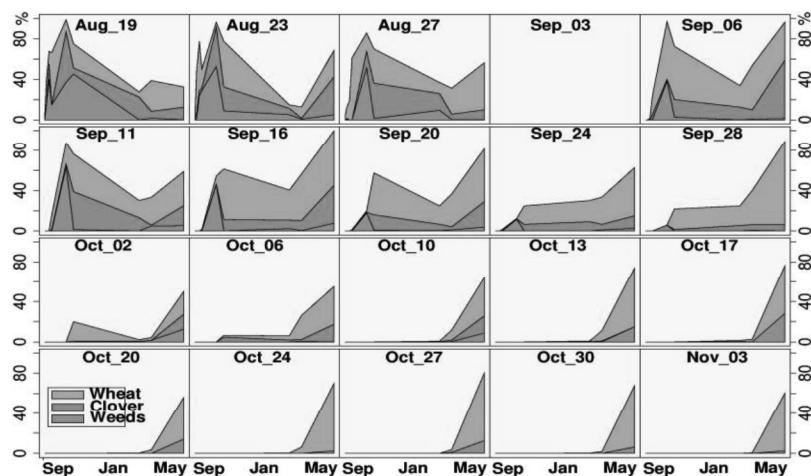
Figure 1 shows an example of the development of ground cover by wheat, clover and weeds at 20 different seeding dates. Early seeding favored the development of subterranean clover, which was not more present when seeded after October. Wheat yield had its optimum when planted in October (data not shown), and, due to competition by clover and weeds, was strongly reduced by very early planting. The best compromise among grain yield, weed occurrence, presence of subterranean

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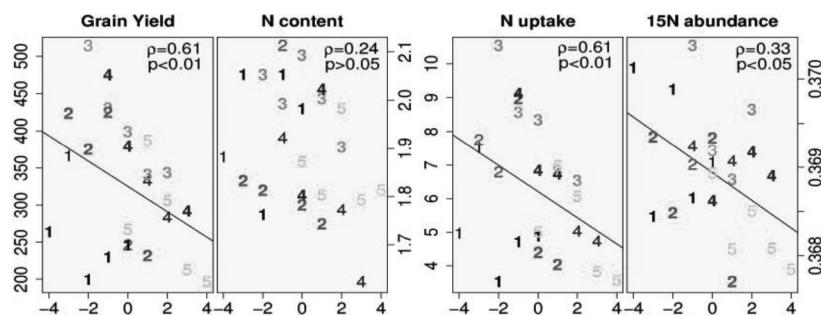
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clover and ground cover duration was seeding at mid-September. Clover competitiveness and therefore its yield is enhanced if clover is planted before wheat, the advantage increases with the length of the time interval. Total N uptake behaved similarly to grain yield, while no clear tendency could be observed concerning grain N content.  $^{15}\text{N}$  abundance was lower when clover was sown before wheat, indicating that the nitrogen absorbed by wheat plants had been fixed partly by the associated legume in the same season (Figure 2). The correct seeding time is crucial for successful establishment of living mulch systems, while seeding clover and wheat at different dates seems not to justify the additional effort.



**Figure 1:** Example for the growth dynamics of wheat, subclover and weeds with different seeding dates planted simultaneously (ground cover in %, measured by digital image analysis, 2012)



**Figure 2:** Effect of relative seeding date (rank) on yield, N content, N uptake and  $^{15}\text{N}$  abundance (Numbers: absolute seeding date, rank)

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