

Uniform seed patterns in wheat cultivation

Daniel Herrmann

Julius Kühn Institute, Institute for Application Techniques in Plant Protection, Braunschweig

E-mail of corresponding author: daniel.herrmann@julius-kuehn.de

For many years, wheat is the most important crop cultivated all over the world. It is grown in various cultivation systems from rudimentary hand seed to powerful and expensive seeding machines. Nevertheless, the process of seeding is nearly all the same: the seed is randomly distributed in the field. Especially with modern seeding equipment, there is a big spread between the distances from one plant to another in the row and between the rows. Hence, the distance between the single plants is very unequal.

Due to these space problems, plants are exposed to various stresses. In the narrow plant population there is a moist microclimate, which benefits fungal growth and intensifies plant disease. The tight spaces between the plants in the row and a wide distance between the rows lead to a contrast in water and nutrition availability and the rhizosphere. Because of the limited space for a single plant, it is unusual that plants reach their potential yield maximum. In terms of climate change and stricter nutrition regulations these stresses getting a bigger problem in future agricultural production systems.

A possibility to fight these stresses is to optimize the distribution of each single plant in the field. Many authors described that with uniform seed pattern plants grow more evenly and less plants can gain the same yield compared to ordinary seeding techniques with twice as much plants. The best possible distribution of plants is reached by seeding pattern in an equilateral triangle. In an equilateral triangle, the distance between the

single plants in and between the rows is all the same. Because every plant has an optimized space for growing, fewer plants are needed to harvest maximum yield.

In 2018 a field experiment at the Julius Kühn Institute in Braunschweig, Kleinmachnow and Quedlinburg started. Compared are equilateral triangle seed patterns to conventional seeding with common plant density and reduced plant density. The equilateral triangle patterns were sown by hand which took much time and is not practical. Another aim of this project is to develop practical seeding equipment to plant grain in equal seed patterns.

In the field, it is obvious that plants grown in uniform seed patterns develop more regular. Because of more root space, plants are tighter connected to the ground and can be more resistant to weather extremes or mechanical weed control. The ears are nearly twice as long compared to the conventional seeding. Finally yet importantly, the yield is comparable to conventional seeding.

In the common years, more field experiments are planned. It is the aim to get more information about the differences in plant health, finding best genotypes for uniform seed pattern and consider differences in plant requirement in water and nutrients. Maybe it is possible to establish some kind of new cropping system to compete future needs in sustainable agriculture and produce more food for a growing population.