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Hairy vetch cover crop affects weed diversity and composition in no-till sunflower

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Vicia villosa Roth, or hairy vetch, is one of the most productive cover crops (CC) in Mediterranean dry areas, with an interesting potential as dead mulch in no-tillage cropping systems. In low-input cropping systems, mechanical termination of hairy vetch could replace a glyphosate application to control weeds. Mechanical termination (e.g. with a roller crimper) of hairy vetch is ineffective until the late growing stages of vetch, leading to delayed sowing and yield reduction in the following crop.

To find the best compromise in timing between effective termination of vetch and reasonable yield of no-till sunflower, an on-farm experiment was carried out in Pisa (Italy) in 2012/13 and 2013/14 to compare three termination techniques (roller crimper with no, half and full dose of glyphosate) and three termination dates (before flowering, beginning of flowering, 70% of flowering of vetch). Data on weed biomass, species density and soil cover were collected at CC termination and during sunflower growth. Weed diversity and composition were analyzed through ANOVA, PERMANOVA and NMDS.

Weed abundance was significantly affected by the two factors and by their interaction, but only in the 2013/2014 season. The highest weed reduction was reached when 70% of the vetch was flowering, for the roller crimper and half dose of glyphosate treatments. Diversity, evenness and richness did not increase in mechanically-treated plots. Later termination dates reduced species richness in 2012/2013, while in 2013/2014 termination at the beginning of flowering had the lowest species richness. Weed composition in both years was mainly influenced by termination date (variance explained: 27.0% in 2013 and 47.4% in 2014). Roller crimper applied when 70% of the vetch was flowering showed results that were similar to standard herbicide-based techniques in any parameter considered. Therefore, roller crimper applied when 70% of the vetch is flowering may lead to a reduction in weed abundance comparable with standard herbicide-based techniques, without negatively affecting weed diversity.