J Plant Physiol Pathol 2018, Volume 6
DOI: 10.4172/2329-955X-C2-018

Cover cropping and crop diversification for sustainable crop production in semiarid agroecosystems

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The decline in irrigation water availability, soil organic matter content, and crop yields challenged the sustainability of dryland and limited-irrigation agriculture in semiarid agroecosystems. Cropping systems that integrate cover crops into crop rotations, reduce tillage intensity and frequency, and maintain residue covers have the potential to improve the agricultural sustainability and increase farm profitability. Relevant literature was reviewed on the effects of cover crops on soil organic matter (SOM) dynamics, soil water conservation, and crop yields in dryland cropping systems, and a study was conducted at the NMSU Agricultural Science Center at Clovis, NM to evaluate the effects of cover crops (CC) on SOM dynamics, nutrient cycling, soil microbial community structure, crop yields, and profitability of a winter wheat-sorghum-fallow rotation. Soil samples were collected at cover crop planting and termination, at wheat planting, and wheat and sorghum harvest, and analyzed for SOM pools, nutrients, and microbial community structure. Besides, data were collected on weed density, crop yields, and economic profitability. Soil moisture content was 27% lower at CC termination than at CC planting, but it was recovered by 115% at wheat planting in all CC treatments. Fallow plots had significantly greater available N at CC termination, and it was not significantly different between CCs and fallow at wheat planting and harvesting while it was considerably lower in pea, pea-canola mixture, and pea-oat-canola mixture than fallow at jointing stage of wheat. Available P was reduced by 70% at CC termination than at CC planting. However, it was recovered by 96% at wheat planting and by 98% at jointing stage. Canola had significantly greater potentially mineralizable carbon than pea-canola and pea-oat-canola mixtures while six-species mixture had significantly greater permanganate oxidizable carbon than canola. Crop diversification through cover cropping show potential to increase SOM, improve nutrient cycling, and thereby support sustainable crop production.

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