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Vadose Zone Journal Abstract - Special Section: Advancing Soil Physics for Securing Food, Water, Soil and Ecosystem Services

Black Film Mulching and Plant Density Influencing Soil Water Temperature Conditions and Maize Root Growth

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Core Ideas:

- Transparent film mulching increased the soil water storage more than black film mulching.
- The mulching treatment only markedly increased the soil temperature in the maize seeding growth stage.
- Higher plant density decreased the root surface area, root volume, root length, and root diameter.

Abstract

Plastic mulch in combination with high plant density is a common agronomic technique in rainfed maize (*Zea mays* L.) production. However, the effects of combining colored film mulching and plant density on soil temperature, soil water storage, the maize roots, and yield

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have not been thoroughly elucidated to date. Thus, a field experiment to explore the effects of colored film mulching and plant density on soil temperature and water, maize roots, and yield was conducted on main plots with three types of mulching (non-mulching, transparent film mulching, and black plastic film mulching), which were divided into three subplots with three plant densities (60,000, 75,000, and 90,000 plants ha⁻¹). The results were as follows: The mulching increased the soil water storage during the entire period of maize growth, and transparent film mulching increased soil water storage more than black film mulching. The mulching only markedly increased soil temperature in the maize seeding and jointing stages compared with the non-mulching treatment, but the plant density augmented the soil temperature after the seeding stage. Compared with the non-mulching treatment, the mulching treatments significantly increased root length, root length density, and root diameter by 17.0, 21.4, and 11.6%, respectively, during the heading stage and by 65.2, 70, and 11.6%, respectively, during the mature stage. As plant density increased, root surface area, root volume, root length, and root diameter decreased. The best combination, which attained higher yield and profit than other treatments, was the combination of a plant density of 90,000 plants ha⁻¹ and black film mulching.

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