

甘肃旱作大豆全膜双垄种植的土壤水热及产量效应

杨封科^{1,3**}, 王立明^{2,3}, 张国宏^{2,3}(1甘肃省农业科学院, 兰州 730070; ²甘肃省农业科学院旱地农业研究所, 兰州 730070; ³农业部西北作物抗旱栽培与耕作重点开放实验室, 兰州 730070)**Effects of plastic film mulching with double ridges and furrow planting on soil moisture and temperature and soybean yield on a semiarid dryland of Gansu Province, Northwest China.**YANG Feng-ke^{1,3}, WANG Li-ming^{2,3}, ZHANG Guo-hong^{2,3}(1Gansu Academy of Agricultural Sciences, Lanzhou 730070, China; ²Institute of Dryland Agriculture, Gansu Academy of Agricultural Sciences, Lanzhou 730070, China; ³Key Laboratory of Northwest Drought resistant Crop Farming, Ministry of Agriculture, Lanzhou 730070, China)

摘要

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摘要

以晋豆23为材料,在甘肃省农业科学院镇原试验站进行田间试验,研究了全膜双垄沟播(FMRFC)、覆膜沟播(FMFC)、覆膜条播(FMSC)和露地条播(NMSC,CK)4个处理的水热及产量效应.结果表明:在大豆生育期降水量为246.3 mm(干旱年)和407 mm(丰水年)两种年型下,各覆盖处理0~20 cm土层平均地温在24 h内呈“S”型变化,并随生育进程波动振幅缩小.各覆盖处理使大豆苗期(VE~V3)至鼓粒期(R6)0~20 cm土层平均土壤温度显著提高0.5~2.5 ℃,并使全生育期平均地温提高1.3~1.6 ℃.各覆盖处理分别加速了大豆植株对 0~120 cm土层土壤水分的消耗,但使0~200 cm土层的平均含水量和贮水量分别提高了1.2%~1.4%和62.7~70.3 mm.与CK相比,FMRFC和FMFC在早年增温增湿作用显著,改善了大豆株高、分枝数、单株荚数和百粒重等经济性状,使水分利用效率分别提高47.7%~56.3%和33.3%~35.4%,产量分别提高27.7%~51.1%和10.2%~25.2%,是旱作大豆优选的抗寒抗旱覆盖种植方式.

关键词: 土壤水热效应 全膜双垄 产量 旱作 大豆

Abstract:

Taking soybean cultivar Jindou 23 as test object, a field experiment was conducted at the Zhenyuan experimental station of Gansu Academy of Agricultural Sciences to study the effects of various plastic mulching treatments on the soil moisture and temperature and soybean grain yield on a semiarid dryland of Northwest China. Four treatments were installed, *i.e.*, plastic film mulching with double ridges and furrow planting (FMRFC), plastic film mulching without ridges and with furrow planting (FMFC), plastic film mulching with strip planting (FMSC), and no mulch strip planting (NMSC, CK). During the drought year (the precipitation in soybean growth period was 246.3 mm) and wet year (407 mm), the daily soil temperature in 0-20 cm layer in all mulching treatments varied in “S” shape, and its fluctuation became smaller with soybean growth. The mulching treatments raised the daily average soil temperature in 0-20 cm layer by an average of 0.5-2.5 ℃ from the seedling (VE-V3) to seed filling (R6) stage, with the average soil temperature in whole growth period raised by 1.3-1.6 ℃. Both in dry year and in wet year, mulching treatments promoted the soil moisture consumption in 0-120 cm layer by soybean, but increased the average soil moisture content and water storage in 0-200 cm layer by 1.2%-1.4% and 62.7-70.3 mm, respectively. As compared to CK, treatments FMRFC and FMFC had significant effects in improving the soil temperature and moisture environment in dry year, and greatly improved the yield

related traits such as plant height, branching number, pods per plant, and 100-seed mass. FMRFC increased the yield by 27.7%-51.1% and raised the water use efficiency (WUE) by 47.7%-56.3%, whereas FMFC increased the yield by 10.2%-25.2% and raised the WUE by 33.3%-35.4%, as compared to CK. It was suggested that FMRFC and FMFC could be the most efficient planting systems for the soybean production in the dryland farming of Northwest China.

Key words: soil moisture and temperature effect plastic film mulching with double ridges and furrow planting yield dryland farming soybean.

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