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降雨特性和覆盖方式对麦田土壤水分的影响

Effects of rainfall characteristics and covering methods on soil moisture of winter wheat

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英文关键词:soils moisture rain winter wheat simulated rainfall cover storage amount

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中文摘要:

为探明不同降雨特性和覆盖方式对冬小麦土壤水分的影响，利用人工模拟降雨器，模拟40和60 mm/h 2种降雨强度，在大田设置地膜覆盖（PM）、秸秆覆盖（覆盖量分别为1 500、4 500、7 500和10 500 kg/hm2，即SM15、SM45、SM75和SM105），同时设置无覆盖处理作为对照（CK），研究不同降雨强度和覆盖方式对雨后冬小麦0～60 cm土层土壤水分分布和降雨土壤蓄积量的影响。结果表明：模拟降雨前各覆盖处理土壤含水率均比CK高，其中0～20 cm土层土壤含水率差异显著（P＜0.05），而20 cm以下各处理土壤水分相差较小，除SM105与CK差异显著外（P＜0.05），其他处理与CK差异不显著；同一覆盖处理，60 mm/h 降雨强度条件下降雨入渗深度和入渗量明显高于40 mm/h。在相同雨强条件下，不同覆盖处理可以不同程度的增加耕层土壤含水率，其中秸秆覆盖量越大，效果越明显，而PM效果最差；2种雨强条件下各处理0～60 cm土层降雨土壤蓄积量规律表现一致，即SM105＞SM75＞SM45＞SM15＞CK＞PM，其中SM105和SM75均显著高于CK (P<0.05)， PM则显著低于CK（P<0.05）；受植株冠层降雨截留的影响，同等降雨条件下，同一覆盖处理拔节前降雨土壤蓄积量大于拔节后的；相比60 mm/h降雨强度，40 mm/h降雨强度下各处理拔节前、后降雨土壤蓄积量变化幅度较大。

英文摘要:

In order to study the effects of different rainfall characteristics and covering methods on soil moisture of winter wheat, rainfall simulation with rainfall intensity of 40 and 60 mm/h was conducted by using the artificial rainfall simulator. Influences of different covering methods on soil moisture distribution and rainfall storage in soil layer of 0-60 cm under simulated rainfall situations were investigated with setting plastic mulching (PM) , straw mulching with four quantities of 1 500, 4 500, 7 500, and 10 500 kg/hm2 (SM15、SM45、SM75 and SM105) and no mulching (CK) in winter wheat field. Results indicated that before rainfall simulating, soil water content in all treatments of mulching was greater than that in CK, of which there was significantly difference in 0-20 cm soil layer (P<0.05) and a little difference beneath 20 cm soil layer, except for SM105, other treatments showed no significant difference compared with CK (P<0.05). Rainfall infiltration depth and volume with 60 mm/h of rainfall intensity was significantly greater than that with 40 mm/h under the same covering treatment and rainfall duration. Soil moisture in plough layer increased in different degrees in all treatments with the same rainfall intensity, which the greater the amount of straw mulch was, the more obvious the increase, but the effect of PM treatment was the worst. At two rainfall intensity conditions, the rainfall storage amount in 0-60 cm soil layer of each treatment had consistent order as SM105>SM75>SM45> SM15>CK>PM, of which SM105 and SM75 were significantly higher than that of CK (P<0.05) and the value of PM was significantly lower than that of CK (P<0.05). As effect of rainfall interception by plant canopy, the rainfall accumulation before the jointing stage was greater than that after the jointing stage under the same rainfall intensity and covering conditions. Compared to the rainfall intensity of 60 mm/h, there was a big difference for the rainfall accumulation amount of each treatment with 40 mm/h rainfall intensity before and after the jointing stage.

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