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长期施肥及不同施肥条件下秸秆覆盖、灌水对土壤酶和养分的影响

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摘要:

以陕西省合阳县的28年定位试验为依托,通过主成分分析和聚类分析,研究了施肥及不同施肥条件下秸秆覆盖、灌水对土壤脲酶、磷酸酶、转化酶、过氧化氢酶活性和土壤养分含量的影响。结果表明,NP肥施用对土壤脲酶无显著影响,而使磷酸酶、转化酶活性分别较对照提高119.6%和22.0%,NP有机肥(NPM肥)使脲酶、磷酸酶、转化酶活性分别较对照提高53.2%、130.8%和60.6%,NPM肥的作用大于NP肥;秸秆覆盖和灌水对脲酶、磷酸酶、转化酶活性的影响因施肥条件不同而表现不同;NP肥能提高土壤速效氮、速效磷和全氮含量,NP肥施用基础上灌水能提高土壤有机质、碱解氮和速效磷含量,NPM肥施量、NP肥及NPM肥施用基础上秸秆覆盖均能显著提高土壤有机质、碱解氮、速效磷、速效钾、全氮和全磷含量,其中速效磷的提高幅度最大,NPM肥较对照提高64.4mg/kg,NPM肥基础上秸秆覆盖使速效磷含量较施用NPM肥提高44.0mg/kg,施肥、秸秆覆盖和灌水对土壤全钾含量和过氧化氢酶活性影响总体上不显著。主成分分析和聚类分析表明,NPM肥和NPM肥结合灌水更有利于土壤养分和酶活性综合因子的提高,提高土壤肥力;秸秆覆盖有利于提高土壤养分,不利于酶活性综合因子的提高;灌水的影响较小。生产上应注意大量秸秆覆盖对土壤酶活性的不利影响。

关键词: 施肥 秸秆覆盖 灌水 土壤酶活性 长期定位试验

EFFECT OF LONG-TERM FERTILIZATION, STUBBLE MULCH AND IRRIGATION UNDER DIFFERENT FERTILIZATION ON SOIL ENZYME AND SOIL NUTRIENTS

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Abstract:

On the basis of the 28-year experiment located in Heyang County, Shaanxi Province, effects of fertilization, stubble mulch and irrigation under different fertilization on soil urease, phosphatase, invertase, hydrogen peroxidase activities and contents of soil nutrients were studied through principal component analysis and cluster analysis. Results were as follows: the activities of urease was not influenced by NP treatment, the activities of phosphatase and invertase increased 119.6% and 22.0% by NP treatment respectively. The activities of urease, phosphatase and invertase increased 53.2%, 130.8% and 60.6% by NPM treatment, respectively, thus effects of NPM on enzyme activities were obviously higher than that of NP. Effects of stubble mulch and irrigation on urease, phosphatase and invertase activity were different due to different fertilization. The contents of alkaline nitrogen, available phosphorus and total nitrogen were increased by NP and the contents of soil organic matter, alkaline nitrogen and available phosphorus were increased by irrigation under NP treatment. The contents of soil organic matter, alkaline nitrogen, available phosphorus, available potassium, total nitrogen and total phosphorus were increased by NPM and stubble mulch treatment. In addition, the content of available phosphorus in NPM treatment was 64.4mg/kg higher than that in control, which was 44.0 mg/kg higher in NPM combined with stubble mulch treatment than NPM treatment. Fertilization, stubble mulch and irrigation had no obvious influence on the content of total potassium and hydrogen peroxidase activity in soil. Principal component analysis and clustering analysis showed that nutrient factor and enzyme activity factor of soil were easily increased by NPM and NPM combined irrigation, stubble mulch was helpful to increase soil nutrient factor, but not to increase enzyme activity factors, and irrigation was not so effective as fertilization or stubble mulch. It is necessary to pay attention to the negative effect of stubble mulch on enzyme activities.

Keywords: fertilization stubble mulch irrigation soil enzyme activities long-term experiment

收稿日期 2011-04-19 修回日期 2011-08-31 网络版发布日期

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基金项目:

山西农业大学博士后基金,中国科学院知识创新工程重大项目(KSCX-YW-09-02,KSCX-YW-09-07),国家重点基础研究发展计划(2009CB118604)

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