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# 棉秆作为无土栽培基质的适宜发酵条件

## Favorable conditions of cotton straw composting using as soilless culture substrate

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中文摘要:

为了研究棉秆作为无土栽培基质的最佳发酵条件，用正交设计的方法研究了C/N、秸秆长度、添加氮源对棉秆发酵性能参数（包括发酵温度、有机碳、通气孔隙度、水孔隙度、积温、种子发芽指数、电导率、pH值和容重）的影响。结果表明，在发酵过程中，C/N为25:1、秸秆长度为1 cm、氮源为鸡粪+尿素的处理有利于堆体保持较间的高温（>50℃），分别达到9、10、8 d，可缩短秸秆腐熟的时间。C/N对总孔隙度降低的影响显著，C/N为25:1的处理达到66.0%，降低了24.8%。秸秆长度对持水孔隙度、容重提高和积温有显著性作用，秸秆长度为1 cm的处理分别达到59.2%、0.30 g/cm3、1315.75℃，与发酵前相比持水孔隙度提高了111.1%，容重提高了76.4%。氮源对温有显著性影响，氮源为鸡粪+尿素的处理达到1 354.41℃。确定棉秆宜采用C/N为25:1，秸秆长度为1 cm、氮源为鸡粪+尿素的组合进行发酵。该研究中将棉秆发酵后作炭的替代品，不仅减少了对草炭开采造成的生态破坏，还能促进农业废弃物的循环利用，并且大幅度降低了无土栽培基质的成本，将会产生巨大的经济及环境效益，具重要的研究价值和现实意义。

英文摘要:

Abstract: The aim of this study was to find the optimal conditions for cotton straw composting as a Soilless Culture Substrate. Cotton straw size, carbon-nitrogen ratio, and nitrogen source were investigated to determine their effects on the process of cotton straw composting by using an orthogonal design method. Each factor was set at three levels: ratios were 25:1, 30:1, 35:1, cotton straw sizes were 1, 2, and 3 cm, and nitrogen sources were chicken manure、urea, and a mixture of chicken manure and urea. Cotton straw applie this trial was bought from the famers in a Beijing suburb and was broken into 1-3cm particles by machine. The C/N ratio of cotton straw was 38:1. The dry chicken manure and urea the nitrogen resource were used to adjust the C/N ratio. The cotton straw weight of each treatment was 5 kg, and the water content of each treatment was adjusted to 60%-70%. P weaving bags of 70-liter capacity were used as composting containers and were placed in three layers with a randomized design. Each treatment had one bag and three replication The bags were turned over every 10 days during the maturation phase in order to improve the O2 level inside the bags. The trial lasted 30days.The parameters included compostir temperature, C/N ratio, bulk density, pH, EC, accumulated temperature, water holding capacity, and air filled porosity. A temperature meter recorded the temperature in each bag ev day. Bulk density and porosity were determined following the Byrne method and conventional method, respectively. The pH and electrical conductivity (EC) were determined by I Portable pH/mV/thermometer measurement.The results from the study indicated that during the composting period, C/N ratio of 25:1, 1 cm straw particle size, the mixture of chicke manure and urea as an added nitrogen source were the optimal conditions to sustain high temperature (>50℃) in the composting pile of cotton straw, and the days keeping high temperature in the three conditons was 9, 10, 8 days respectively. The C/N ratio had a significant influence on total porosity reduction, with the highest value (66.0%) in a C/N of 2 and that in pre-composting decreased by 24.8% compared with after composting. Cotton straw size had a significant influence on water-holding capacity、accumulated temperatu and bulk density increase, and the highest values (59.2%, 1 315.75℃, 0.30 g/cm3 ) occurred with a cotton straw size of 1cm. Compared with pre-composting, the water holding capa after composting increased by 111.1%, and the bulk density increased by 76.4%. Nitrogen source (chicken manure and urea) had a significant influence on accumulated temperatu and the highest measured value (1 354.41℃) occurred with the mixture of chicken manure and urea as the nitrogen source. Recommended values are a C/N ratio of 25:1, 1cm cottor straw particle size, and a mixture of chicken manure and urea as an added nitrogen source for cotton straw composting.

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