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## 施用生物质炭对土壤腐殖质组成和胡敏酸结构特征影响

## Effect of biochar application on composition of soil humus and structural characteristics of humic acid

关键词: [玉米秸秆生物质炭](#) [腐殖质组成](#) [有机碳](#) [胡敏酸](#) [结构特征](#)基金项目: [国家自然科学基金项目\(No.41171188\)](#)

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**摘要:** 为研究玉米秸秆生物质炭施用后土壤腐殖质组成和土壤胡敏酸结构的变化,选择腐殖质组成修改法和国际腐殖质协会推荐的方法进行土壤腐殖质组分提取和HA样品纯化,采用重铬酸钾外加热法和TOC分析仪测定土壤、水溶性物质(WSS)、富里酸(FA)、胡敏酸(HA)和胡敏素(Hu)有机碳含量,采用元素组成和红外光谱分析HA的结构变化。研究表明:施用玉米秸秆生物质炭后,表层和亚表层土壤及其腐殖质组分有机碳含量均有不同程度的提高,表层土壤、WSS、FA、HA和Hu有机碳含量增加幅度较大,分别增加了83.61%、112.50%、89.63%、91.78%和89.82%,说明玉米秸秆生物质炭的施用更有助于表层土壤有机碳的积累;PQ值(HA在腐殖质中的比例)略有增加;土壤HA的缩合程度和芳香性增强,氧化度降低。此外,施用玉米秸秆生物质炭后,土壤及其腐殖质组分有机碳含量随土层深度的增加而降低,与表层相比,亚表层土壤、WSS、FA、HA和Hu有机碳含量分别下降了62.84%、52.94%、62.38%、66.62%和61.61%;土壤PQ值略有降低;土壤HA的缩合程度和芳香性降低,氧化度增加。

**Abstract:** In order to study the changes in the composition of humic substance and the structure of humic acid of soil with application of biochar derived from the corn straw, the modified method of humic substance composition and the method recommend by IHSS were adopted to extract the humic components and purify the humic acid (HA) sample. The thermal oxidation of  $K_2Cr_2O_7$  and TOC analyzer were applied in analyzing the C contents of water-soluble substances(WSS), fulvic acid(FA), humic acid(HA) and humin(Hu), and the structural changes were indicated from the elemental composition and FTIR. The results showed that the organic C contents of soil humic components all increased in the surface and subsurface of soil with the application biochar. The organic C contents of surface soil were enhanced by 83.61%, 112.50%, 89.63%, 91.78% and 89.82% respectively compared with the CK treatment. It was indicated that the biochar derived from the corn straw was beneficial for the accumulation of organic C, with slightly increased PQ value (the ratio of HA/(FA+HA)), enhanced condensation degree and aromatic degree of HA, and decreased oxidation degree. Furthermore, the organic C contents in the soil humic components decreased with the soil depth after the application of biochar. Compared with the surface soil, the organic C contents of WSS, FA, HA and Hu decreased by 62.84%, 52.94%, 62.38%, 66.62% and 61.61% respectively. PQ value decreased significantly, which indicated that the condensation degree and aromatic degree of HA could be lowered, but the oxidation degree of HA extracted from the surface soil was enhanced.

**Key words:** [corn straw-derived biochar](#) [humic substance composition](#) [organic C](#) [humic acid](#) [structural characteristics](#)

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