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小麦秸秆浸提液和腐解液对水稻的化感效应

Allelopathic effects of wheat straw extract and decomposition liquid on rice

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中文摘要:

通过设置小麦秸秆浸提液和腐解液对水稻种子发芽和幼苗生长发育影响试验，明确小麦秸秆对水稻的化感效应。水稻种子萌发试验采用平板培养法，水稻生长发育试验采用砂培法。试验结果表明：与对照相比，小麦秸秆浸提液和腐解液均显著降低水稻种子的发芽指数和水稻植株生物量、叶绿素含量以及根系活力（$p<0.05$），同时显著增加水稻植株丙二醛含量（$p<0.05$）；小麦秸秆腐解液对水稻的化感效应强于秸秆浸提液，小麦秸秆叶部浸提液对水稻的化感效应强于茎秆浸提液，小麦秸秆15 d腐解液对水稻的化感效应强于7 d腐解液；4种浸提液或腐解液5倍稀释后均减缓了对水稻发芽和植株生长发育的抑制作用。小麦秸秆浸提液和腐解液的总酚酸含量均较高，含量介于90.80~222 mg L^{-1}，且总酚酸含量与水稻植株鲜重、根系活力、叶绿素以及水稻发芽指数显著负相关，而与水稻植株丙二醛含量显著正相关。小麦秸秆浸提液和腐解液均对水稻产生化感效应，其作用强度与秸秆腐解方式、秸秆不同部位及腐解时间有关，同时小麦秸秆化感效应的产生与浸提液和腐解液中的酚酸含量有关。

Abstract:

An experiment was carried out to investigate effects of wheat straw extract and wheat straw decomposition liquid on seed germination and seedling growth of rice, and to define allelopathic effect of wheat straw on rice. The straw used in the test came from mature wheat crop. Wheat straw extract was prepared by putting wheat straw in 30 ℃ pure water for extraction for 48 h, and wheat straw decomposition liquid was prepared by immersing wheat straw in 30 ℃ water for incubation for 7 or 15 days. The rice seed germination test was carried out using the plate culture method and the rice growth test using the sand culture method. Results show that compared with the control, the extract and the liquid both decreased seed germination index, plant biomass, chlorophyll content and root activity of the rice, significantly ($p<0.05$), while increasing malondialdehyde content in the plant, significantly ($p<0.05$). The liquid demonstrated stronger allelopathic effect than the extract, wheat leaf extract than stem extract, and the 15 day liquid than the 7 day liquid. Once diluted five folds, the extracts and liquids became less in their effect on rice germination and plant growth. The extracts and liquids were all quite high in total phenolic content, ranging from 90.80~222 mg L^{-1}. Total phenolic acid content was significantly and negatively related to rice plant fresh weight, root activity, chlorophyll and rice germination index, while malondialdehyde content in the plant was positively related. The allelopathic effects of the extracts and liquids varied in strength, which was related with straw decomposition method, different parts of straw and length of decomposition time, and to the total phenolic acid content in the extracts or liquids, as well.

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