Simple, non-invasive disease screening method: scanning hair samples is simple, cheap and non-invasive, which not only facilitates diagnosis and treatment, but also promotes the work efficiency of doctors, which is of positive significance to disease diagnosis.

The hair microscope macro-scanning system has been basically built: the hair micro-scanning system can automatically and quickly collect complete hair microscopic images. The built hair scanning device can be used to collect the microscopic images of each segment of the hair. By stitching the segmented hair images, a complete and non-repetitive microscopic image of the whole hair can be formed.

УДК 2

秸秆还田结合氮肥减施对东北黑土细菌真菌多样性影响

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Summary. *Straw return to the soil and chemical fertilizer application reduction and efficiency increase are so important that we analyzed the bacterial and fungal diversity under different straw return and chemical fertilizer treatments. The results between microbial diversity and soil physico-chemical properties will provide a basis for the conservation of black soil and farmland management practices in China.*

Black soil is an important non-renewable soil resource and plays an important role in grain production. For the loss of the black soil resources in northeast China [1–2], combining with the agricultural industry structure and the natural climate conditions and increase the intensity of straw returned to work, this project study how different ways of straw returned in combing with nitrogen reduction effect the northeast black soil microbial community structure, function and the role of the relationship between soil environmental factors. We hope to solve the black soil problem by returning straw to the field and reducing fertilizer application.

This project adopted returning directly (SD), carbonized (BC) and conventional methods of straw counters-field ridge tillage with no straw returning scale (CK) and ammonia fat reduction approach of combining, through 16s/18s/ITS rDNA high-throughput sequencing technologies, and data processing software, Measurementing a variety of different conditions corporal soil physical and chemical properties of pH, total carbon (TC), total ammonia (TN), total phosphorus (TP), and effective phosphorus. This project analysis the genetic diversity of northeast black soil bacteria and fungi, at the same time, this project analysis the relationship between microbial diversity and soil physical and chemical properties.

Under the same type of straw treatment, with the increase of the amount of N applied, the quantity of the microorganism increased. According to data observation, together used with straw and nitrogen fertilizer had a significant impact on bacterial species diversity ($P < 0.001$), while separate use of straw and nitrogen fertilizer had no significant impact on bacterial species diversity and richness.When only use bio-carbon, bacterial richness and diversity reached the highest. And fungus' OTUs were not significantly different under these treatments. The differences between groups were significantly greater than the differences within groups ($P < 0.01$), and proves the rationality of grouping.

Most of samples from soil under straw returning were positively correlated with pH, AK, TC, TN, C/N, SOC.Bacteroidetes,Proteobacteria were observed to have a positive correlation with AK($P < 0.05$), pH, TC, TN, C/N, SOC. Actinobacteria, Gemmatimonadetes were negatively affected by these soil parameters and positively correlated with AP, WC and TN.All SD-treated samples were positively correlated with SOC, pH, C/N, AK and TN. Ascomycota,Blastocladiomycota were observed to have a positive correlation with TN, TP, AP and WC contents in soils.

The dominant fungal phyla across all soil samples were Ascomycota and Basidiomycota. Cluster analysis showed that returning straw shifted soil fungal community structure greater than

adding biochar. Compared with CK, the relative abundance of pathogenic fungi, Fusarium,decreased in the BC treatments and SD treatments.In addition, our findings demonstrated that both SD treatments and BC treatments increased the relative abundance of Proteobacteria, regardless of N fertilization.At the genus level, all samples were dominated by genus Sphingomonas, which accounted for 5.18–8.37 % of the total sequences.

Under the BCN60 treatment, the OTUs of bacterium gradually decreased, because the microorganism compete the N in soil with straw, laying the foundation for increased dry matter accumulation and ultimately higher yields. In this study, biochar amendment significantly increased the bacterial community diversity in bulk soil This may be related to the changes of chemical properties induced by biochar amendment. The abundance of fungi is mainly regulated by the way the straw is returned to the field. The possible reasons may be the addition of straw significantly affected the water storage capacity of the soil, and the fungus was enriched due to the nature of regulating water storage.

Our data show that the bacterial phyla Proteobacteria increases upon straw application and Actinobacteria decreases upon nitrogen fertilizer application.Proteobacteria and Actinobacteria are copiotrophic taxa[3]. From the results of CCA,We hypothesized that their changes were due to treatments that changed the soil C/N .In CCA analysis, SOC was positively correlated with SD treatment, while Ascomycota,Basidiomycota was negatively correlated with SOC, indicating that straw returning reduced the amount of Ascomycota,Basidiomycota by increasing organic carbon. This is contrary to another finding (Song, Liguo, et al).

In our research, adding biochar and straw returning to the field both increase their relative abundance when nitrogen reduction is 40 % and 100 %, but decrease their relative abundance without nitrogen reduction. The result indicated that members of the Basidiomycetes could be adversely affected by high N dose [4].The decrease of relative abundance of Fusarium may hint that biochar amendment and straw returning to field could be beneficial for suppressing crop diseases [5].The abundance of Proteobacteria increased in SD and BC treatments because they mainly participated in the initial stage of straw decomposition [6].Those results indicated that both straw and biochar application altered the structure of microbial communities, while the effects of straw on the relative abundances of major bacterial phyla were higher than those of biochar.

References

1. Li, R.; Gao, Y.; Chen, Q.; Li, Z.; Gao, F.; Meng, Q.; Li, T.; Liu, A.; Wang, Q.; Wu, L.; Wang, Y.; Liu, Z.; Zhang, M., Blended controlled-release nitrogen fertilizer with straw returning improved soil nitrogen availability, soil microbial community, and root morphology of wheat. Soil and Tillage Research 2021**,** 212.
2. Song, L.; Hou, L.; Zhang, Y.; Li, Z.; Wang, W.; Sun, Q., Regular Biochar and Bacteria-Inoculated Biochar Alter the Composition of the Microbial Community in the Soil of a Chinese Fir Plantation. Forests 2020**,** 11 (9).
3. Yaliang, L.; Yan, G.; Chunsheng, W.; Hongxiang, Z.; Wenhe, H.; Chen, X.; Xifeng, C., Short-Term Straw Returning Improves Quality and Bacteria Community of Black Soil in Northeast China. Polish Journal of Environmental Studies 2022, 31 (2), 1869-1883.
4. Zhou, J.; Jiang, X.; Zhou, B.; Zhao, B.; Ma, M.; Guan, D.; Li, J.; Chen, S.; Cao, F.; Shen, D.; Qin, J., Thirty four years of nitrogen fertilization decreases fungal diversity and alters fungal community composition in black soil in northeast China. Soil Biology and Biochemistry 2016, 95, 135-143.
5. Yao, Q.; Liu, J.; Yu, Z.; Li, Y.; Jin, J.; Liu, X.; Wang, G., Three years of biochar amendment alters soil physiochemical properties and fungal community composition in a black soil of northeast China. Soil Biology and Biochemistry 2017, 110, 56-67.
6. Wang, E.; Lin, X.; Tian, L.; Wang, X.; Ji, L.; Jin, F.; Tian, C., Effects of Short-Term Rice Straw Return on the Soil Microbial Community. Agriculture 2021, 11 (6).