

The effect of adding corn steep liquor on the microbes of corn stalk compost in the preparation of *Stropharia rugosoannulata*

JI Kuai-le¹,GAO Ying¹,ZHAO Li-qin¹,FAN Bo-wen¹,YANG Feng-jun^{1*}

¹College of Horticulture and Landscape Architectur,Heilongjiang Bayi Agricultural University,Daqing 163000,China

*Corresponding author. Email: Yangfengjun@126.com

Background

Stropharia rugosoannulata is one of the mushroom species that have developed well in my country in recent years.The substrate for growing stropharia in the Northeast is mainly obtained from composting corn stalks.Composting is a widely recognized and effective method to produce organic fertilizer by degrading agricultural waste through microbial metabolism^[1-2],the nitrogen source is an important factor in the composting process.As a by-product of corn starch processing, corn steep liquor is a cheap organic raw material,however,most companies currently cannot make good use of corn syrup and choose to discharge it directly,causing serious pollution to the environment.

Methods

The experiment was carried out in the experimental base of Heilongjiang Bayi Land Reclamation University in September 2020, and it took 9 days in total.There are two treatments, namely, straw composting with 10% corn steep liquor (CS) and straw composting with the same amount of urea (CK),Except for the different sources of nitrogen, the remaining materials and management after composting are completely the same.Take samples at 5 different points at three depths (10cm, 30cm, and 60cm from the surface of the pile) on the 0th,3rd,6th,and 9th days,and immediately mix the samples evenly,test to determine the physical and chemical properties of these samples,and take high-temperature samples for high-throughput sequencing.

Results

The temperature of CS is basically higher than that of CK from 0 o'clock (Fig.1), except for some time periods.and CS enters the high temperature stage earlier than CK (the temperature reaches 50°C),this is conducive to the elimination of pathogens in the compost pile [3].The pH in CK has always been significantly lower than the pH of CS,and from the 6th day to the 9th day, the pH of CK and CS is always between 7.5-8.5.But the pH of CK is always lower than 7.4 (Fig. 2),Therefore, the composting efficiency of CS may be greater than that of CK,This result may be due to the volatilization

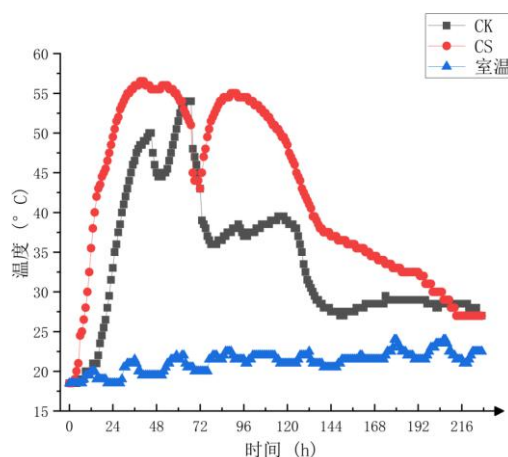


Fig. 1 change trend of temperature in two composts

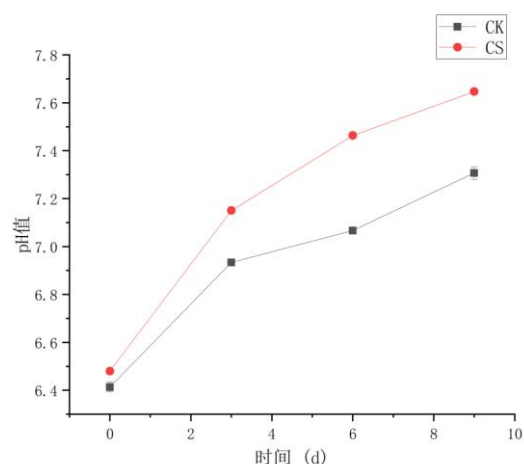


Fig. 2 PH in two composts

of ammonia in the fertilizer pile and the rapid decomposition of organic acids by microorganisms[4].

In the two treatments,the composition of the bacterial community changed significantly during the

composting process (Fig. 3). At the level of phyla classification, the bacterial community composition of the two treatments was similar, and 4 main phyla were identified, namely Actinomycetes, Proteobacteria, Firmicutes and Bacteroides. However, there are big differences in the composition of different bacterial groups, which may be related to the different temperatures and pH of the two treatments during the composting process. The results of this experiment show that adding corn steep liquor to a certain extent can provide a better growth environment for actinomycetes and Firmicutes.

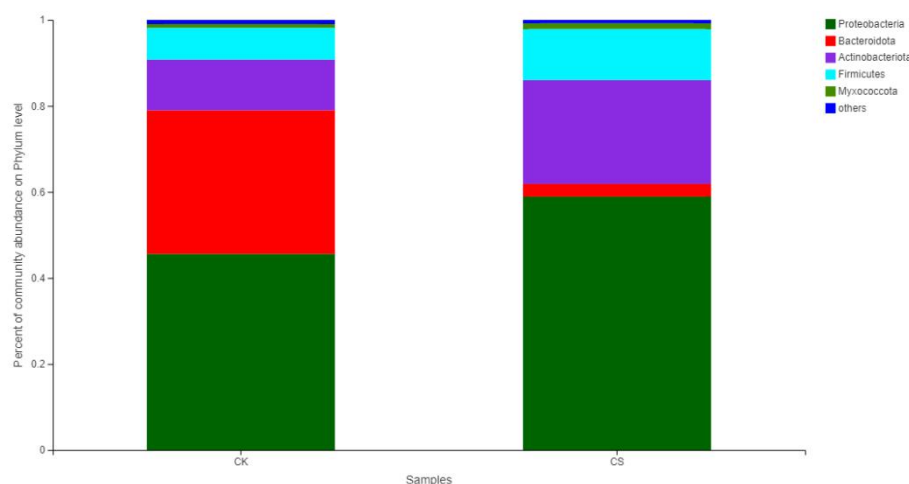


Fig. 3 Microbial community structure of bacteria at pHyllum level

Conclusion

In the process of making *Stropharia rugosoannulata* culture material, corn steep liquor can replace urea as a supplementary nitrogen source in corn stalk compost. And during the composting process, the addition of corn steep liquor changed the composition ratio of the bacterial community. Especially in the thermophilic stage, it promotes the growth of Actinobacteria and Bacteroides, while inhibiting Bacteroides.

References

- [1] Jain, M.S., Jambhulkar, R., Kalamdhad, A.S., 2018. Biochar amendment for batch composting of nitrogen rich organic waste: Effect on degradation kinetics, composting physics and nutritional properties. *Bioresour. Technol.* 253, 204–213.
- [2] Awasthi, M.K., Zhang, Z.Q., Wang, Q., Shen, F., Li, R.H., Li, D.S., Ren, X.N., Wang, M.J., Chen, H.Y., Zhao, J.C., 2017. New insight with the effects of biochar amendment on bacterial diversity as indicators of biomarkers support the thermophilic phase during sewage sludge composting. *Bioresour. Technol.* 238, 589–601.
- [3] Meng, Q., Yang, W., Men, M., Bello, A., Xu, X., Xu, B., Deng, L., Jiang, X., Sheng, S., Wu, X., Han, Y., Zhu, H., 2019b. Microbial Community Succession and Response to Environmental Variables During Cow Manure and Corn Straw Composting. *Front. Microbiol.* 10, 529.
- [4] Qian, X., Shen, G., Wang, Z., Guo, C., Liu, Y., Lei, Z., Zhang, Z., 2014. Co-composting of livestock manure with rice straw: characterization and establishment of maturity evaluation system. *Waste Manag.* 34 (2), 530–535.