

Isolation of a nicotine degradation bacterium strain and its application in the tobacco stalks organic fertilizer composting fermentation

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Abstract

A bacteria strain EA-17 which demonstrated strong ability to degrade nicotine was isolated from soil collected in the Hubei Enshi district, it was identified as *Arthrobacter histidinolorans*. The strain EA-17 was added to tobacco stalks as raw material in the composting fermentation, and the results showed that strain EA-17 could grow well in compost, nicotine degradation rate could be increased by 50% compared with the control, the cellulose and hemicelluloses degradation rate increased 26.29% and 17.52%. Through the compost temperature, pH value, total nitrogen, water-soluble ammonium nitrogen and nitrate nitrogen content analysis showed that strain EA-17 had positive effect in promoting the maturity of the composting fermentation.

Objectives

To isolated bacteria capable of degrading the nicotine, and to use them to degrade the nicotine in the tobacco stalks so that improve fermenting bacteria strains growing environment, promote the maturity of tobacco stalks organic fertilizer.

Materials and methods

Nicotine degradation bacterium strain was isolated from soil collected under continuous tobacco planting in Enshi district, Hubei province, PR China.

Repeatedly to purity, morphological observation, physiological and biochemical analysis and 16SrDNA sequence homology analysis were carried out.

The treatment (T) was strain EA-17 and four high efficiency cellulose degradation bacteria strains were inoculated into tobacco stalks pill for the amount of 0.2%, the control (CK) was no strain EA-17.

Nicotine degradation rates and some indexes Indicated the process of composting were determined.

Results and discussion

The strain EA-17 was classified as *Arthrobacter histidinolorans*, it could grow with nicotine as the sole carbon source, and degraded the 0.5-4 g L⁻¹ concentration of nicotine within 24 hours.

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High temperature stage in pill of the treatment and CK was about 32 days and 25 days. At the end of composting, the pH value in pill of the treatment and CK was 7.17 and 7.87, ammonium nitrogen content of the treatment and CK were 59 mg kg⁻¹ and 120 mg kg⁻¹, Nitrate nitrogen content of the treatment and CK were 1745 mg kg⁻¹ and 1366 mg kg⁻¹.

the cellulose degradation rate of the treatment and CK were 59.71% and 50.81%, the hemicellulose degradation rate were 66.01% and 52.27%, The lignin degradation rate of the treatment and CK were 23.91% and 24.30% which had no obvious difference.

Fig.1. The changes of nicotine content during the composting process

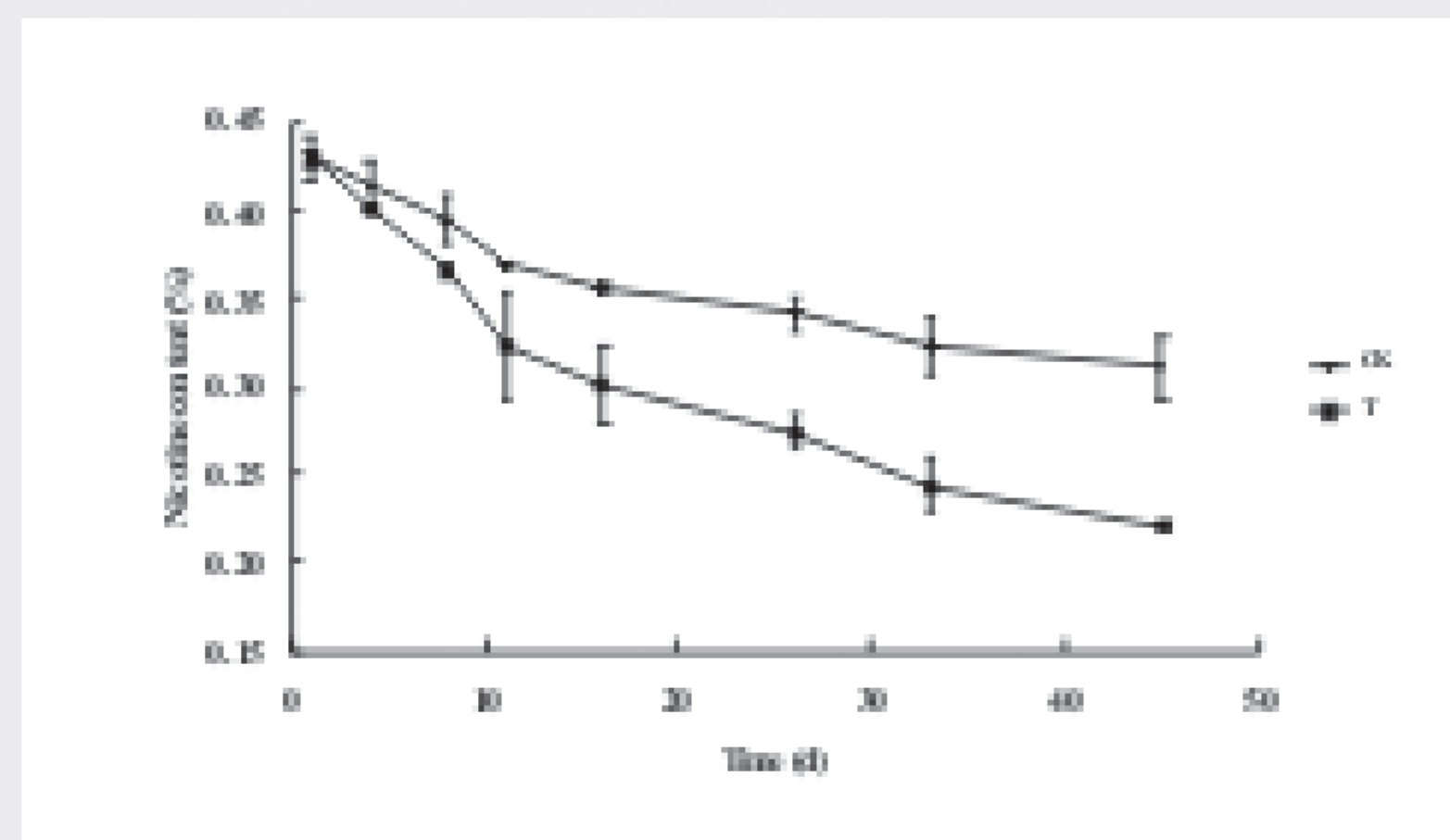


Fig.2. The changes of pH value in pile during the composting process

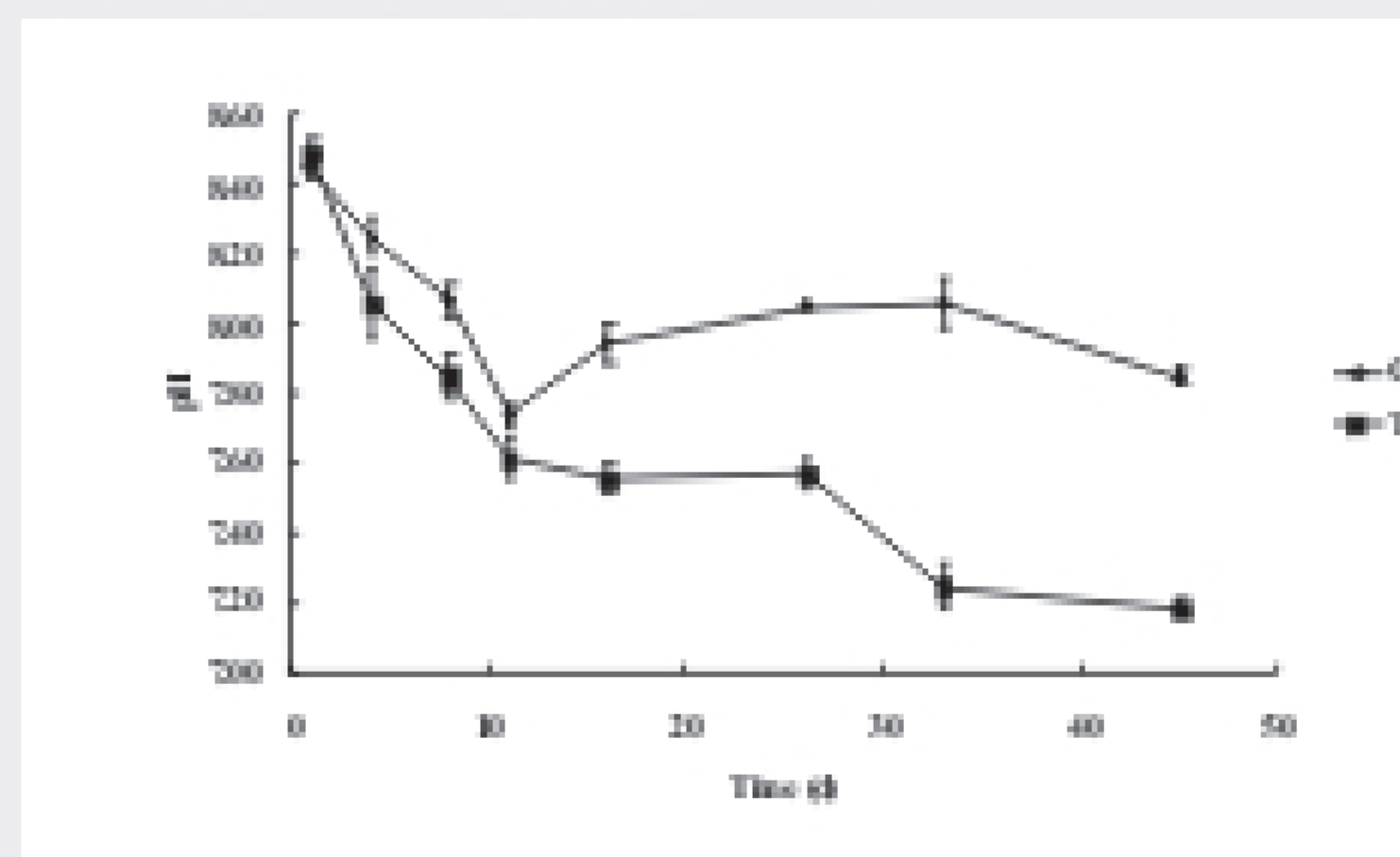


Fig.3. The changes of nitrate nitrogen and ammonium nitrogen content in pile during the composting process

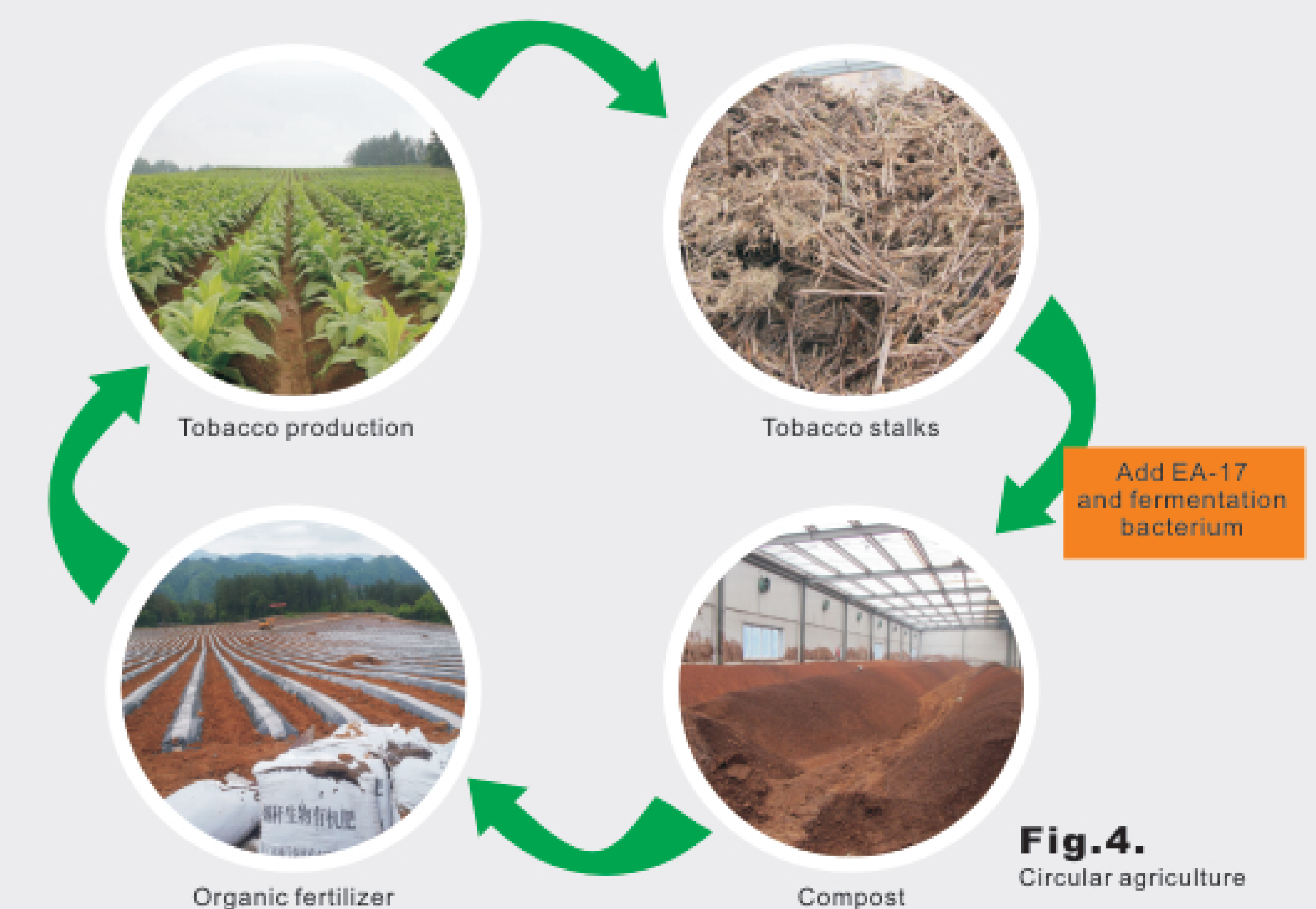
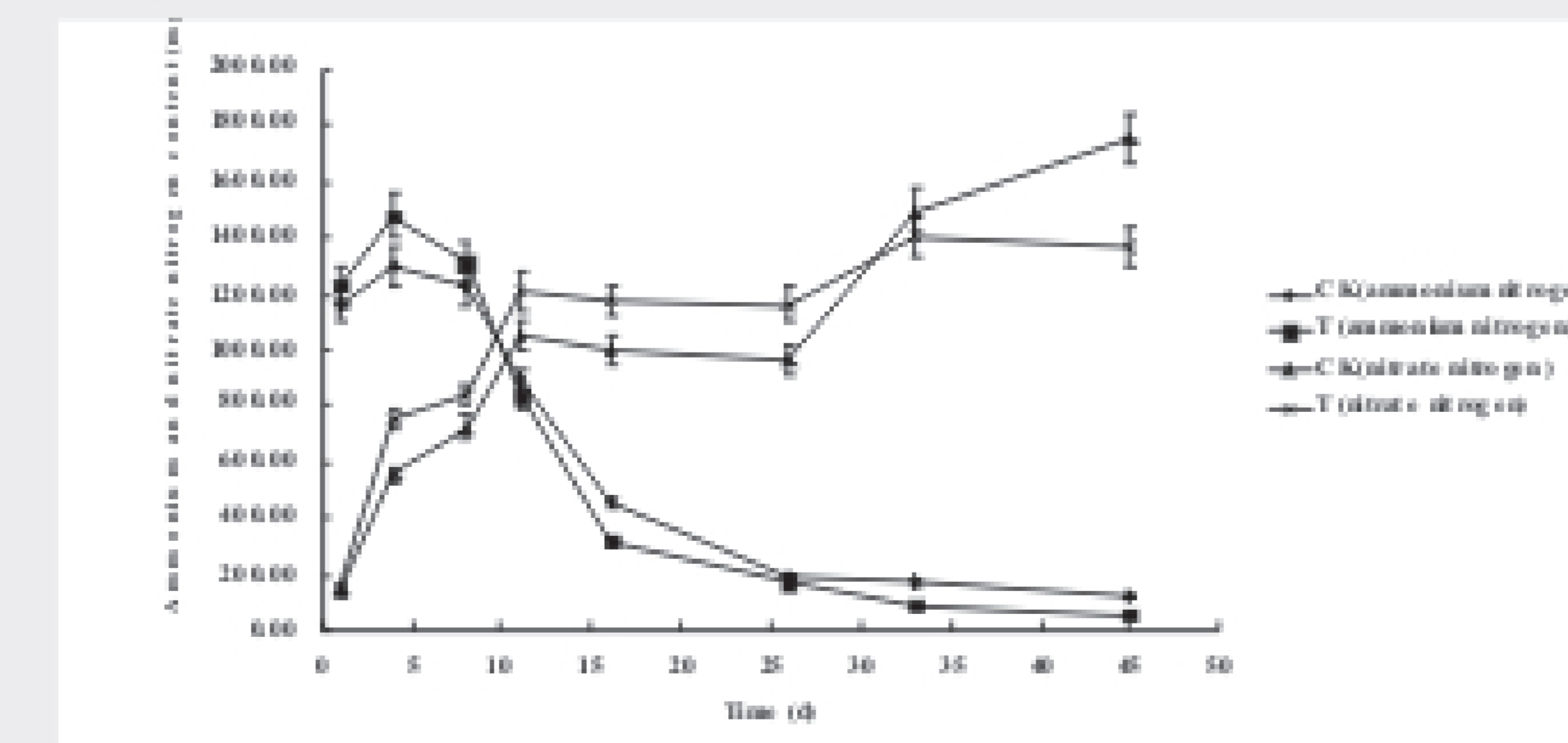


Fig.4. Circular agriculture

Conclusion

Arthrobacter histidinolorans EA-17 demonstrated strong ability to degrade nicotine. When it was added to tobacco stalks as raw material in the composting fermentation, it could degrade nicotine in the tobacco stalks, improve fermenting bacteria strains growing environment, and thus accelerate composting fermentation progress.