云南师范大学

Yunnan Normal University

硕士研究生学位论文

Thesis of Science Master Degree

生物有机肥替代化肥种植蔬菜以及网络营销平台构建研究——以晋宁区杨户村为例

Research on Replacing Fertilizer with Bio-organic Fertilizer in Vegetable Planting and Construction of Network Marketing Platform -- A Case Study of Yanghu Village, Jinning District

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摘要

晋宁被誉为“全国蔬菜生产强县”和“中国鲜切花生产第一县”，2023 年晋宁区蔬菜产量是 60 万吨，鲜切花产量是 56 亿枝。但蔬菜和鲜花在生产和销售过程中产生大量的蔬菜尾菜、花卉剪枝等农业有机废弃物，这些农业有机废弃物被随意堆放，不仅占用土地，而且污染环境，制约绿色农业发展。娃娃菜和绿萝生菜是晋宁蔬菜种植量较大的两种叶类蔬菜，可以为人类生存提供必要的微量元素，但蔬菜生长过程中施加过多的化肥导致蔬菜品质下降，土壤环境逐渐恶化。如何在降低化肥使用量的同时提高蔬菜品质、改善土壤肥力并且有效利用农业有机废弃物一直是困扰晋宁农业发展的一个问题。因此，本文通过大田实验，将农作物秸秆、花卉秸秆等农业有机废弃物制成的生物有机肥配施化肥去种植娃娃菜、绿萝生菜，设置常规化肥 21 kg/亩（CK）、常规化肥+1t/亩生物有机肥（A）、1/2 常规化肥+1t/亩生物有机肥（B）、1/2 常规化肥+2t/亩生物有机肥（C）、3t/亩生物有机肥（D）5 个处理组对娃娃菜和绿萝生菜的生长发育、品质、产量以及土壤理化性质影响的研究。实验结果如下：

（1）生物有机肥可以改善土壤环境。两组实验中，随着绿萝生菜和娃娃菜的生长，土壤中的有机质、腐殖质、有效磷含量上升且差异显著；土壤中的硝态氮、铵态氮降低，同时土壤中的 pH、电导率先增后降再增。这说明施加生物有机肥可以提高土壤中的有机质、腐殖质、有效磷等养分含量；实验田中的硝态氮和铵态氮含量较高，硝态氮容易吸收硝酸盐，施加生物有机肥可以降低硝态氮、铵态氮含量，促进作物健康生长；适量的生物有机肥可以降低碱性土壤中的 pH 值和电导率，进而提高土壤肥力。

（2）生物有机肥可以促进娃娃菜、绿萝生菜的生长发育。在两组实验中，施加生物有机肥对绿萝生菜的还原糖、叶绿素 SPAD 值、Vc、株高、根长、叶片数、鲜重有明显促进作用且差异明显，B 处理组的还原糖、株高、根长效果最好，与 CK 组相比分别提高 15.0%、7.8%、9.1%，D 处理组的叶绿素 SPAD 值、鲜重效果最好，与 CK 组相比分别提高 15.9%、14.2%，对绿萝生菜的总糖、幅宽没有影响。施加生物有机肥对娃娃菜的还原糖、总糖、Vc、株高、根长、

幅宽、鲜重有明显提高作用，B 处理组的 Vc、株高、幅宽、鲜重效果最好，与 CK 组相比分别提高 15.8%、2.0%、1.2%、49.1%，A 处理组的还原糖、总糖效果最好，与 CK 处理组相比，分别提高了 17.6%、15.4%，D 处理组的根长效果最好，对娃娃菜的根粗并没有影响。当施加生物有机肥的时候，绿萝生菜 B 处理组（1/2 常规化肥+1t/亩生物有机肥）的综合效果最佳，其鲜重与 CK 相比提高了 14.0%；娃娃菜 B 处理组（1/2 常规化肥+1t/亩生物有机肥）最优，其鲜重与 CK 处理组相比提高了 49.8%。

（3）通过综合分析，得出生物有机肥种植绿萝生菜综合排名的顺序是：B>A>D>CK>C。生物有机肥种植娃娃菜综合排名的顺序是：B>A=CK>D>C。说明 B 处理组（1/2 常规化肥+1t/亩生物有机肥）是种植绿萝生菜和娃娃菜的最佳值。

根据文献以及实验结果，首先对生物有机肥营销环境进行分析，得出我国生物有机肥需求旺盛、产能不断提高，但是销售渠道单一、产品同质化严重、服务不完善等问题存在；其次对晋宁区的蔬菜秸秆、花卉秸秆等农业有机废弃物进行资源量分析，了解到晋宁区拥有丰富的农业有机废弃物，这些农业有机废弃物被大量闲置，污染环境，制约绿色农业发展。

通过大田实验说明生物有机肥可以改善土壤环境、促进绿萝生菜和娃娃菜的生长发育，对晋宁区发展生物有机肥进行一个效益分析和 SWOT 分析，得出晋宁区农业发展好、政策支持生物有机肥发展、生物有机肥市场广阔，但销售渠道相对单一，渠道不深入。因此结合当下发展较好的互联网构建生物有机肥营销平台，从而方便用户快速购买能够生物有机肥、明确产品来源、了解使用方法，企业通过网络营销平台能够快速进行推广、节约营销成本，政府通过网络营销平台对生物有机肥进行统一管理，让农户更放心使用。促进晋宁县农业有机废弃物资源化利用种植有机蔬菜，减少农业面源污染。

关键词：生物有机肥；晋宁蔬菜；蔬菜品质；土壤理化性质；网络营销平台

Abstract

Jinning is known as "national strong vegetable production county" and "China's first county of fresh cut flower production". In 2023, the output of vegetables in Jinning District is 600,000 tons, and the output of fresh cut flowers is 5.6 billion. However, vegetables and flowers produce a large number of agricultural organic wastes such as vegetable tails and flower pruning in the process of production and sales. These agricultural organic wastes are piled up at will, which not only occupy land, but also pollute the environment and restrict the development of green agriculture. Baby cabbage and green lettuce are two kinds of leafy vegetables with a large amount of vegetable planting in Jinning, which can provide necessary trace elements for human survival. However, excessive fertilizer applied in the process of vegetable growth leads to the deterioration of vegetable quality and soil environment. How to improve vegetable quality, soil fertility and agricultural organic waste effectively while reducing fertilizer use has been a problem in the agricultural development of Jinning. Therefore, in this paper, through field experiments, biological organic fertilizer made from agricultural organic waste such as crop straw and flower straw is combined with chemical fertilizer to grow baby cabbage and green lettuce. Set conventional fertilizer 21 Effects of kg/ mu (CK), conventional chemical fertilizer +1t/ mu bio-organic fertilizer (A), 1/2 conventional chemical fertilizer +1t/ mu bio-organic fertilizer (B), 1/2 conventional chemical fertilizer +2t/ mu bio-organic fertilizer (C), and 3t/ mu bio-organic fertilizer (D) on the growth, quality, yield and soil physicochemical properties of baby cabbage and lettuce. The experimental results are as follows:

(1) Bio-organic fertilizer can improve the soil environment. In the two experiments, the contents of organic matter, humus and available phosphorus in soil increased significantly with the growth of lettuce and baby cabbage. The nitrate nitrogen and ammonium nitrogen in the soil decreased, while the pH and conductivity in the soil increased first, then decreased and then increased. The results showed that

the application of bio-organic fertilizer could increase the contents of organic matter, humus and available phosphorus in soil. The content of nitrate nitrogen and ammonium nitrogen in the experimental field is high, and nitrate nitrogen is easy to absorb nitrate. The application of bio-organic fertilizer can reduce the content of nitrate nitrogen and ammonium nitrogen and promote the healthy growth of crops. Appropriate bio-organic fertilizer can reduce pH and conductivity in alkaline soil and improve soil fertility.

(2) Bio-organic fertilizer can promote the growth and development of baby cabbage and green lettuce. In the two groups of experiments, the application of bio-organic fertilizer had significant promoting effects on reducing sugar, chlorophyll SPAD value, Vc, plant height, root length, leaf number and fresh weight, and the reducing sugar, plant height and root length of the B treatment group were the best, which were increased by 15.0%, 7.8% and 9.1% compared with the CK group, respectively. The chlorophyll SPAD value and fresh weight of the D treatment group had the best effect, which were increased by 15.9% and 14.2% compared with the CK group, respectively, and had no effect on the total sugar and width of the lettuce. The application of bio-organic fertilizer significantly increased the reducing sugar, total sugar, Vc, plant height, root length, width and fresh weight of baby cabbage. The Vc, plant height, width and fresh weight of group B had the best effect, which was increased by 15.8%, 2.0%, 1.2% and 49.1% compared with group CK, respectively. The reducing sugar and total sugar of group A had the best effect, which was compared with group CK. It was increased by 17.6% and 15.4% respectively. The root length of D treatment group was the best, and the root thickness of baby cabbage had no effect. When applying bio-organic fertilizer, the comprehensive effect of green lettuce B treatment group (1/2 conventional fertilizer +1t/ mu bio-organic fertilizer) was the best, and its fresh weight was increased by 14.0% compared with CK. Baby cabbage B treatment group (1/2 conventional fertilizer +1t/ mu bio-organic fertilizer) was the best, and its fresh weight increased by 49.8% compared with CK treatment group.

(3) Through comprehensive analysis, it is concluded that the comprehensive ranking of bio-organic fertilizer planting green lettuce is in the order of B>A>D>CK>C. The order of overall ranking of bio-organic fertilizer planting baby cabbage is:

B>A=CK>D>C. The B treatment group (1/2 conventional fertilizer +1t/ mu bio-organic fertilizer) is the best value for growing green lettuce and baby cabbage.

According to the literature and experimental results, firstly, the marketing environment of bio-organic fertilizer was analyzed, and it was concluded that China's bio-organic fertilizer has strong demand and continuous improvement of production capacity, but there are problems such as single sales channel, serious product homogeneity and imperfect service. Secondly, the agricultural organic waste such as vegetable straw and flower straw in Jinning District was analyzed, and it was learned that Jinning District had abundant agricultural organic waste, which was left idle in large quantities, polluting the environment and restricting the development of green agriculture.

Field experiments show that bio-organic fertilizer can improve the soil environment and promote the growth and development of green lettuce and baby cabbage. A benefit analysis and SWOT analysis on the development of bio-organic fertilizer in Jinning District show that the agricultural development of Jinning District is good, the policy supports the development of bio-organic fertilizer, and the bio-organic fertilizer market is broad, but the sales channels are relatively single and the channels are not deep. Therefore, combined with the current better development of the Internet to build a bio-organic fertilizer marketing platform, so as to facilitate users to quickly buy bio-organic fertilizer, clear product sources, understand the use of methods, enterprises through the network marketing platform can quickly promote, save marketing costs, the government through the network marketing platform for the unified management of bio-organic fertilizer, so that farmers more assured use. Promote Jinning county agricultural organic waste resource utilization to grow organic vegetables, reduce agricultural non-point source pollution.

Key words: Bio-organic fertilizer; Jinning vegetables; Vegetable quality; Soil physicochemical properties; Internet marketing platform

目录

第 1 章 绪论

1.1 研究背景

民以食为天。人类文明的进步与农业息息相关，农业的发展为人类社会的进步提供物质基础。当今社会形式越来越复杂，经济压力巨大，面对复杂的经济环境，必须竭尽全力稳住农业的发展。农业作为我国社会发展的第一产业，取得了显著的成效，据《中国农业展望报告（2023—2032）》指出，我国农业农村改革发展取得明显成效，克服了疫情灾情、国际粮价剧烈波动等不利因素，稳住了基本盘，为经济社会大局稳定提供了基础支撑。我国是蔬菜大国，蔬菜产量一直保持稳定增长的趋势，我国蔬菜产量从 2017 年的 6.92 亿 t 增长至 2022 年的 7.91 亿 t，年均复合增长率达 2.25%[1]。晋宁区在蔬菜产业方面经历了显著的进展，此地区不仅被命名为全国的产业先锋，更跻身于优秀无公害蔬菜生产的先行区域，并成为云南省蔬菜生产的策略要地。据 2018 年数据显示，晋宁区拥有 21.9 万亩的蔬菜种植土地，产出高达 47.2 万吨，创造了 14.35 亿元的经济产值。到 2021 年，该区域蔬菜总产量甚至超越了 50 万吨大关，经济产值得以微增至 14.5 亿元[2]。晋宁区是全球温带花卉最佳产地，也是中国鲜切花生产第一县，花卉种植面积超过 6 万亩，其鲜切花种植面积、产量均属于云南省第一[3]。晋宁县的蔬菜和花卉在生产过程中会产生大量的残株体以及腐烂的叶、根、茎等农业有机废弃物。

我国农业种植取得了不错的成绩，得益于化肥的施用，我们国家的化肥施肥技术已经达到一定的分阶段水准。然而，全球范围内，包括中国在内的化肥使用令人忧虑，特别是中国的农作物施用量为 328.5 千克/公顷，远高于全球平均水平 120 千克/公顷[4-5]。化肥的出现及应用完成了粮食作物的农民致富，经济发展作物也获得大幅度发展趋势，但大量化肥的使用出现了土壤板结、土壤肥力下降、农作物品质降低等一系列问题[6]。鉴于此背景，农业农村部先后出台了《到2025年化肥减量化行动方案》、《到2025年化学农药减量化行动方案》等政策，以引领化肥及农药使用量的下降趋势。此项计划一经部署，便得到了众多省市的响应与支持，它们纷纷制订并施行相应政策以落实减量增效的目标。