

Grower Summary

M 056

Understanding Mushroom Nutrition: Project aimed at improving yield, substrate efficiency and utilisation and flavour

Annual 2014

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Project Number: M 056

Project Title: Understanding Mushroom Nutrition: Project aimed at improving yield, substrate efficiency and utilisation and flavour

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Further information

If you would like a copy of this report, please email the HDC office (hdc@hdc.ahdb.org.uk), alternatively contact the HDC at the address below.

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GROWER SUMMARY

Headlines

- Addition of protein-based supplements (ProMycel Gold, Champfood E, MCSustradd and Natural Gold (a lipid-protein blend) to phase 3 composts increased mushroom yields significantly for strain A15.
- Some of the protein-based supplements increased mushroom cap density but none of the supplements affected the dry matter content or the colour of the mushrooms.

Background

The nutrition from compost that is available for mushroom growth is a key factor for the success of the mushroom industry. At the moment we do not have precise knowledge of what nutrition is optimal for the mushroom growth, yield and quality, whether and how nutritional supplements perform on phase 3 compost, and a relevant and precise test for mushroom compost quality. This project aims to evaluate the effects of four different types of compost supplement applied to two different phase 3 composts on crop yield, flushing pattern and quality. This project will also develop our understanding on mushroom nutrition using the mushroom to report on its own biology in response to different supplements by employing microarray technology. This may provide knowledge of how supplements stimulate higher yields and how further improvements can be developed. The four supplement types under evaluation are available as commercial products:

- Protein-based (largely from soy) – three products tested (ProMycel Gold, Champfood E, MCSustradd)
- A blend of lipid and protein-based product (Natural Gold)
- A carboxylic acid-based product (MycroNutrient)
- Mineral micronutrients, a mix of calcium, magnesium, sulphur, boron, copper, iron, manganese, molybdenum and zinc salts (Micromax)

This report is of the first year of the project and provides the results of a proving trial of nutrient supplement use with a brown strain of mushrooms and a full trial of the effects of supplementation on the white strain A15. A further full trial is taking place in the second year of the project. Therefore this report provides interim results and conclusions.

Summary

Supplements for phase 3 composts are used extensively in the UK and European mushroom industry; however we are not aware of a detailed scientific study to compare supplements and to examine whether and how supplements on phase 3 compost are effective in improving mushroom yield and quality. In this two year study we are examining the effects of four different supplement types (protein-based, lipid-protein blend, carboxylic acids and mineral nutrients) on compost temperatures, mushroom yield and quality. During the first year of the project, two crop experiments were carried out: a proving trial was carried out on phase 3 compost spawned with a brown strain, and a major crop experiment during which we measured effects of supplements on two phase 3 compost types (based on straw and chicken manure or based on straw, horse bedding/manure and chicken manure) on A15 mushroom yields and quality.

Initial conclusions are based only on the first year's work and so care must be taken to avoid over-interpretation. From the data so far we can conclude:

- Significant yield improvements were recorded when protein-based supplements (ProMycel Gold, Champfood E, MCSustradd) or a lipid-protein-blend (Natural Gold) were added to phase 3 composts. The highest yield for the straw-based compost was with supplementation with Natural Gold and for the horse manure-based compost the highest yield was with Champfood E supplementation. Micromax and MycroNutrient supplements had no effect on mushroom yields for both compost types. However it should be noted that MycroNutrient is marketed as a casing supplement and this use was not tested in this project
- Averaged over two flushes, the protein-based supplements, ProMycel Gold, and Champfood E, increased the density of the mushroom caps on both types of compost. Mushrooms grown with MCSustradd were not tested for density in both flushes, and the effect in the first flush was not significant. Natural Gold increased mushroom density on horse manure-based compost but not on straw-based compost. The ability to increase the density of mushrooms by application of supplements is an important result as density correlates with mushroom cap texture (an important quality attribute) and increased density should lead to improved picking rates (higher density means more weight picked per mushroom or per hour)
- For the horse manure-based compost, the improvement in yield by protein-based supplements was largely in the first flush, not at all in the second flush and again in

the third flush. For the straw-based compost, the improvement in yield by protein-based supplements was observed in the first and second flushes but not the third flush

- Supplementation did not change the dry matter content of the mushrooms (dry weight/fresh weight ratios). However, the horse manure-based compost produced mushrooms with higher dry matter than the straw-based compost. Further experimentation will determine whether this is a general trend or may represent batch-to-batch variability
- There were no major effects of supplementation on mushroom colour
- Some differences in yield and mushroom quality were observed between the two compost types
- Only one of the supplements used, the protein-based MCSustradd, resulted in a significant yield increase in the brown strain Heirloom

Supplementation of phase 3 composts by protein-based supplements increases mushroom yield significantly. This work has also shown that the degree of yield improvement depends in part on the characteristics of the compost. Growers are advised to note and relate yield to the brand of supplement used. When we make our final report for this project with data from trial 3, we will be in a better position of surety to make clear recommendations.

Brown strains are sometimes grown in unsupplemented compost. The initial results from this work indicate that browns can also benefit from protein supplementation.

Financial Benefits

Clearly there are financial benefits for increased yield of mushrooms by the supplementation of phase 3 compost with protein-based products. These are of course off-set by the cost of supplement. Supplement prices can vary as soy is a world-traded commodity.

In addition, the increase in mushroom cap density by protein-based supplements has positive financial benefits as cap density determines cap texture (an important quality attribute) and a higher cap density leads to the potential for improved picking rates (higher density means more weight picked per mushroom or per hour).

Action Points

This report covers the initial year of this project; as such, it is too early to recommend any action points for growers.