Grower Summary

M 060

Developing alternatives to peat in casing materials for mushroom production

Annual 2014

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AHDB Horticulture,
AHDB
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

AHDB Horticulture is a Division of the Agriculture and Horticulture Development Board.

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Project Leader:	Dr Ralph Noble
Contractor:	East Malling Research Fera
Industry Representative:	Mr James Rothwell
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GROWER SUMMARY

Headline

- Addition of 12.5% of bark fines or 6.3% each of bark fines and mature green waste compost, together with additional water, to peat casing was either beneficial or neutral to mushroom yield.
- Recycled cooked-out casing could be used at 25% with no effect on mushroom yield. A MushComb casing separator machine or inserting a plastic mesh between the compost and casing layers were shown to be possible options in recycling spent casing.
- Mushroom yields from casing prepared from rewetted blocking peat and milled peat fines were comparable with those from wet dug peat casings.
- Positive Taqman PCR test results for *P. tolaasii* and large increases in *Pseudomonas* sp. populations in the casing from application to after the 2nd flush generally corresponded with the occurrence of moderate or severe bacterial blotch.

Background and expected deliverables

Previous research has shown that the most promising peat substitutes in mushroom casing are composted bark fines, mature green waste compost, coir, recycled casing, recycled granulated waste rockwool slabs and filter cake clays. Coir was incorporated into some commercial blends for several years but it is no longer used due to the increased demand and cost of the raw material, particularly for uses such as strawberry grow bags. However, spent coir is a significant disposal problem for the soft fruit industry. In this project, the effect of using the above materials individually and in combinations of materials was investigated. The specific objectives of the project were:

1. To update and summarise any more recent information on peat alternatives in casing published since AHDB Horticulture project M 53
2. To produce data that meets the requirements of EA low risk waste status and/or food safety regulations
3. To undertake commercial farm trials with the five most promising alternative materials identified from small-scale experiments in M 38 and M 53
4. To test how experimental physical, chemical and microbial standards for casing materials relate to mushroom yield, quality and blotch incidence on commercial farms
5. To electronically monitor crop water management and casing water status, and determine how these interact with the performance of casing materials and the occurrence of blotch

6. To communicate and disseminate results to industry
7. To monitor industry uptake of peat substitute casing materials.

Summary of the project and main conclusions

Discussions with several European casing manufacturers have shown that decreasing availability of wet dug peat for mushroom casing is a problem not only in Britain but also in the Netherlands and Belgium. Other types of peat and peat production by-products are available in Britain in sufficient quantities to supply the mushroom industry. A review of potential alternatives to wet dug peat has shown that the most promising peat alternatives were composted bark fines, granulated recycled rockwool slabs, recycled casing, spent coir from grow bags, PAS 100 green waste compost, and filter cake clays.

The following casing materials were used as peat substitute materials in the experiments: (a) pine bark fines (b) mature green waste compost (GWC) (c) used granulated rockwool slabs (d) cooked-out separated spent mushroom casing (e) clay from sand quarries (f) spent coir from strawberry grow bags. The materials were used as individual peat substitutes and in two- and three- way mixes in some of the trials. Peat substitute materials were tested in four peat-based casing materials: three were commercial products containing wet dug peat and sugar beet lime (SBL) (Harte, Sterckx and Topterra) and a fourth casing (Everris) consisted of blocking peat, milled peat fines and SBL or ground chalk.

The main conclusions from the review and mushroom cropping trials conducted at five farms were:

1. The supply of wet dug peat has been discontinued in Britain and dwindling supplies in Germany are also of concern to casing manufacturers in the Netherlands and Belgium.
2. Other types of peat and peat production by-products are available in Britain in sufficient quantities to supply the mushroom industry.
3. A review showed that the most promising alternatives to peat were composted bark fines, granulated recycled rockwool slabs, spent coir from grow bags, PAS 100 green waste compost, and filter cake clays.
4. Mushroom yields and quality from an Everris casing prepared from partially dried blocking peat and milled peat fines were similar to Harte and Topterra casings prepared from wet dug peats.
5. The effects of adding 25% bark fines on mushroom yield were inconsistent between farms. However, addition of 12.5% of bark fines or 6.3% each of bark fines and GWC, together with additional water, to peat casing was either beneficial or neutral to mushroom yield.

6. GWC was unsuitable at an inclusion rate of 25% but at 12.5% had no overall effect. It was best used at 6.3% in conjunction with a similar volume of bark.
7. The effect of addition of 25% recycled rockwool at all three farms where it was tested and in three types of casing was not significant compared with the respective peat control casings.
8. Recycling cooked-out spent casing at 25% had no overall effect on mushroom yield. Casing with salt or disinfectant must be avoided for use in recycling. A MushComb casing separator machine or inserting a plastic mesh between the compost and casing layers were shown to be possible options in recycling spent casing.
9. Filter cake clay at 20% reduced mushroom yield but the effect of 12.5% clay was not significant. However, the material was difficult to mix evenly through the casing.
10. Spent coir was unsuitable for casing because it encouraged green mould.
11. Casing materials with a volumetric water retention at saturation of at least 67% were more suitable than materials with a lower water retention when saturated.
12. Maintaining a casing water volume of at least 61% during cropping produced a better yield than maintaining a lower water volume.
13. Casing water tensions were consistently greater in the second flush than in the first flush across all the farms, in spite of second flush yields being similar or lower than first flush yields; this indicates that more water needs to be applied after the first flush, without draining into the compost.
14. The occurrence of bacterial blotch was not primarily related to the initial population of *Pseudomonas* sp. in casing materials; blotch was mainly associated with one farm which may have had environmental conditions conducive to the disease.
15. Positive Taqman PCR test results for *P. tolaasii* and large increases in *Pseudomonas* sp. populations in the casing from application to after the 2nd flush generally corresponded with the occurrence of moderate or severe bacterial blotch.

Financial and environmental benefits

Recycling of spent casing is a viable option if the casing is cooked out, not treated with salt or disinfectant and a method for removing the casing layer from the compost is available. This work has shown that the MushComb casing separator or a separating plastic net positioned between the casing and compost at the time of casing are possible options. Casing prepared from dried blocking peat and milled peat fines, and rewetted before use, can produce comparable mushroom yields and quality to casing prepared from wet dug peat. This could reduce dependency of the British mushroom industry on imports of wet dug peat. The addition of bark and/or GWC at inclusion rates of 6.3-12.5% v/v, together with

additional water, to peat casing may give yield benefits on some farms. This work has shown that mushroom crops are under greater water stress in the second flush than in the first, indicating that more water needs to be applied to the casing after the first flush, without draining into the compost. The Taqman PCR test for *P. tolaasii* and the measurement of *Pseudomonas* sp. in casing should help to identify conditions that are conducive to bacterial blotch.

Action points for growers and casing producers

- Investigate removal and re-use of cooked out casing – salt or disinfectants must not be applied to the casing before reuse.
- Addition of small (6.3%) amounts of bark and GWC, together with additional water, to peat casing may give yield benefits on some farms. Further work is needed to test if these additions can be made in a casing hopper without the need for a casing mixer.
- Casing prepared from blocking peat and milled peat is a viable alternative to wet dug peat for casing; however, the use of these partially dried peat sources would require a casing mixer.
- Water tension in the casing is much greater in the second flush than in the first flush, indicating that more water needs to be applied after the first flush, without draining into the compost. Volumetric water content of the casing should be kept at least 61% during cropping.
- In the event of a blotch problem, testing of casing during the cropping period using the Taqman PCR test for *P. tolaasii,* and for the total population of *Pseudomonas* sp. may identify where conditions are favourable for the disease.