**Northeast SARE Farmer/Grower Grant**
**INTERIM REPORT**

TO: Dale I. M. Riggs, SARE Northeast, Farmer Grant Specialist
From: John Morelli, Project Leader
Date: August 31, 2006

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Project Title: *Increasing Production and Promoting Adoption of Organic King Oyster Mushrooms*


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Dear Dale,

We have been collecting so much information that we thought is would be helpful to prepare and send you an interim report on our progress. Thus far, it looks quite promising. In our first sample set, we have seen some significant success. Next, we will attempt to duplicate and enhance our best formulations and then evaluate our findings.

Best Regards,

# Table of Contents

## Executive Summary

The purpose of this report is to share with Northeast SARE the progress, to date, of the project funded by its Farmer/Grower Grant of $8,644 and awarded to Flower City Mushrooms (FCM) in April of 2006. The project explores efforts to increase production of the King Oyster mushroom (*Pleurotus eryngii*) using locally produced agricultural products and by-products, as well as promote the adoption of the King Oyster mushroom as a locally available, organic produce item. As yet, our efforts have focused on the former, and are outlined in the Progress Report section of this document. Due to a longer-than-expected time frame required to complete early project tasks, as well as a "2-stage" design study (described in the following sections), we also include a revised project schedule that corresponds to these changes.

## Progress Report

This section details project activities as they have been outlined in our Farmer/Grower Grant proposal. Any changes and/or modifications to proposed tasks are noted.

*Task 1. Research and Feasibility Study Design*

The Research and Feasibility Study Design task, identified as one of the most challenging and time-consuming thus far, involved the review of published works surrounding the production of King Oyster mushrooms. These included works by Stamets, Royse & Sanchez-Vazquez, Luo & Hsu, and the Edible Fungi Institute. Each piece included a discussion of various substrate materials used during King Oyster mushroom production. Substrate is defined as straw, sawdust, compost, soil, or any organic material on which mushroom mycelium (the collection of filament cells that grow into the mushroom body) will grow. Often, mushroom growers will use different substrate "formulas" for different species of mushroom. For example, mushroom growers often prefer a sawdust-based substrate formula for shiitake mushrooms, while a straw-based one is used in oyster mushroom production. These formulas usually include a combination of other materials, such as wheat bran or corn powder, for nutrient supplementation.

Our technical advisor for this project, Bob King, suggested that we choose one control formula for our experiment. We ultimately chose a formula developed by Royse and Sanchez-Vazquez as published in their article "Effect of Brewer's Grain and Delayed Release Nutrient Supplementation on Yield and Size of *Pleurotus eryngii*". This formula was chosen as an experimental control because:

- reported biological efficiencies were greater than 50%[1];
- a detailed breakdown of formula content was available;
- the same spawn strain would be used in FCM's research project; and
- all control formula materials were locally available to FCM.

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[1] Biological Efficiency (BE) is a measure of the ability of a mushroom strain to convert substrate materials into mushrooms. The "Biological Efficiency Formula" states that: 1 pound of fresh mushrooms grown from 1 pound of dry substrate is 100% biological efficiency. This formula assumes that most mushrooms have a 90% water content at harvest[1]. Because the biological efficiency of the control formula used in this research study has already been determined in a previous study (see Royse), this measure of yield will be used to compare the biological efficiencies of the test formulas with that of the control formula in order to assess their viability for commercial King Oyster production.

FCM has selected a quasi-experiment research design to measure and evaluate the feasibility of the various King Oyster production methods employed for this project. Ultimately, economic feasibility will be dependent upon the following parameters: production/quality, time to market, and production costs. Please refer to Appendix A – Quasi-Experimental Design for a more complete discussion of the research design and feasibility analysis.

*Task 2. Process Design*

2.1 Formulation Development

Because oyster mushrooms are degraders of cellulose and lignin, as well as users of protein, we began by characterizing each substrate component of the control formula by these elements and arrived at an overall formula characterization of percentage fiber and protein content. We then developed a methodology that allows us to vary the overall fiber and protein percentage content of various substrate material combinations. Using this methodology, we were able to develop six experimental formulas, in addition to the control formula, that will be used in the first stage of this project.

Formula R1 was designated as the control formula, replicating the experiments of Royse and Sanchez-Vasquez. Formula R2 uses a sawdust-based bulk substrate (supplemented with wheat bran, soybean meal and calcium carbonate) to duplicate the overall fiber and protein content of the control formula. Formula R3 uses a corncob-based bulk substrate (supplemented by sawdust, millet, grape pomace and calcium carbonate) to duplicate the overall fiber and protein content of the control formula. Formula R4 uses a wheat straw-based bulk substrate (supplemented by sawdust, corncob, beet pulp, brewer's grain, grape pomace and calcium carbonate) to duplicate the overall fiber and protein content of the control formula.

For the remaining formulas, the strategy is to vary specific substrate component percentages to correspond with reported successes. Formula R5 uses a sawdust-based substrate to increase overall lignin content, relative to the control formula, by 50%. Formula R6 also uses a sawdust-based substrate to increase overall lignin content by 35% and hemi-cellulose by 25%. Formula R7 essentially reproduces the control formula, but with the addition of 1% sucrose.

The R2, R3 and R4 formulations attempted to duplicate the lignin, cellulose, hemicellulose, and protein content in the R1 control. The R5 and R6 variations are described above. All formulations are described in Appendix B: Formulation Development.

2.2 Production Design

2.2.1 Moisture determination. In order to determine biological efficiency (i.e., the ratio percentage of the wet weight of harvested mushrooms to the dry weight of the substrate from which they were harvested) the moisture content of all substrate materials was determined using the microwave drying method, which involved repeated 2 to 5 minute cooking intervals and weighing of substrate samples until successive measurements were within 0.001 lb. (see Appendix C: Moisture Determination).

2.2.2. Depending upon the size of the substrate blocks, FCM's sterilizer is capable of holding between 60 and 120 blocks. In order to ensure identical environmental conditions for each formulation throughout the research, all formulations needed to be mixed, sterilized, inoculated and incubated during the same time intervals. Two 15 block samples of each formulation were mixed. The first sample set was mixed and inoculated during the week of 7/10 and the second sample during the week of 7/24.

*Task 3. Substrate, Supplement and Spawn*

Basal substrate materials were procured for this work included:

- Organic corn cobs
- Hardwood sawdust (maple/oak)
- Organic red wheat straw

Supplement materials included:

- Brewer's grain
- Grape pomace
- Wheat bran
- Soybean meal
- Millet
- Calcium Carbonate
- Beet pulp
- Sucrose (table sugar)

Spawn:

9 blocks, *Pleurotus eryngii* (King Oyster) – Strain 515 spawn from Northwest Mycological Consultants

*Task 4. Substrate Preparation*

Substrate preparation took place over two 1-week periods, "Batch One" and "Batch Two" respectively. Main substrate materials (corn cob, sawdust and wheat straw) were soaked overnight prior to substrate preparation. Batch One consisted of fifteen 5-pound blocks of substrate per formula, totaling 75 lbs wet substrate weight per formula. Batch Two consisted of sixteen 5-pound blocks of substrate per formula, totaling 80 lbs wet weight per formula. In order to eliminate suspicion of spawn as a source of contamination, should it occur, one block from each formula in Batch Two was used as a 'control' block and was not inoculated with spawn. The microwave method was used to determine formula dry weight prior to sterilization. This will later be used to determine biological efficiency. Each block was inoculated with ½ cup of strain 515 *Pleurotus eryngii* spawn. Batch number and unit number were recorded for future reference, if necessary. Each block was labeled by formula and date of inoculation. See Appendix D: Production Worksheet 1 for more details on substrate preparation.

*Task 5. Production*

Production, to this point, has involved:

- Spawn run (i.e., the vegetative growth phase) of the inoculated blocks. The room temperature is maintained at 68 degrees and 12 hours of overhead light. Weekly photographs are taken of spawn run blocks.
- Fruiting, harvesting, weighing and qualitative assessment. Colonized blocks were opened beginning August 14. Production quantities and initial quality assessments are presented iin Appendix E: Production Worksheet 2.

**Project Schedule Revision**

Due to a longer than anticipated time frame needed to complete tasks 1-4, as well as the modified "stage" approach to the experimental design, the project schedule should be extended to accommodate these changes. Please refer to Appendix F for the proposed modified project schedule.

**Consultant Tasks**

Dr. Robert King has provided input and guidance on research design, sampling protocols, and productivity assessment. He has helped find local suppliers of local substrate materials and has visited Dr. Daniel Royse at Pennsylvania State University to discuss and collect information on mushroom productivity enhancements. He will also review all production calculations as harvests continue.

## APPENDIX A: QUASI-EXPERIMENTAL RESEARCH DESIGN

Two classic quasi-experimental research designs were evaluated and combined for this work, the Comparison-Groups, Pretest-Posttest design, and the Regression Discontinuity Research Design.

***The Non-Equivalent Group Design*** (aka, Comparison-Groups, Pretest-Posttest, Research Design). The non-equivalent group design is an intuitively sensible design and perhaps one of the most commonly used of the quasi-experimental research designs. It combines elements of the Static-Group Comparison and the One-Group Pretest-Posttest Pre-Experiment.

The *Comparison-Group Design* can be diagrammed as follows:

| | | | |
|---|---|---|---|
| $\mathbf{G_1}$ | $\mathbf{O_{1\text{-}1}}$ | **X** | $\mathbf{O_{1\text{-}2}}$ |
| $\mathbf{G_2}$ | $\mathbf{O_{2\text{-}1}}$ | | $\mathbf{O_{2\text{-}2}}$ |

or

Where: G ≡ The group. This can be an experimental control group. Each group has its own line.

O ≡ An observation. This can be the result of a measurement, interview, survey, etc. $\mathbf{O_{1\text{-}1}}$ indicates a pre-treatment (or baseline) measurement for the experimental group, $G_1$; $\mathbf{O_{1\text{-}2}}$ is the post-treatment measurement. $\mathbf{O_{2\text{-}1}}$ and $\mathbf{O_{2\text{-}2}}$ are the corresponding measurements for the control group, $G_2$.

X ≡ A treatment or program. This represents some intervention, something that happened to the experimental group that did not happen to the control group. It could be the introduction of a new voluntary environmental policy, a large environmental regulatory fine, a death, a training program, etc.

- The timeline is from left to right.
- Vertical alignment of the symbols indicates that the measurements or treatments occur at the same time.
- Subscripts indicate subsets of measures.

A *Comparison-Group Design* to assess the effectiveness of different mushroom substrate formulations might look like this:

| Group | $O_1$: Production Rate | Formulation | $O_2$: Production Rate |
|---|---|---|---|
| $G_1$ | $O_{1\text{-}1}$: Mushroom Production (lb/day) | Standard | $O_{1\text{-}2}$: Mushroom Production (lb/day) |
| $G_2$ | $O_{2\text{-}1}$: Mushroom Production (lb/day) | Standard | $O_{2\text{-}2}$: Mushroom Production (lb/day) |
| $G_3$ | $O_{3\text{-}1}$: Mushroom Production (lb/day) | Standard | $O_{3\text{-}2}$: Mushroom Production (lb/day) |
| $G_4$ | $O_{4\text{-}1}$: Mushroom Production (lb/day) | Increased lignin | $O_{4\text{-}2}$: Mushroom Production (lb/day) |
| $G_5$ | $O_{5\text{-}1}$: Mushroom Production (lb/day) | Increased lignin | $O_{5\text{-}2}$: Mushroom Production (lb/day) |
| $G_6$ | $O_{6\text{-}1}$: Mushroom Production (lb/day) | Increased lignin | $O_{6\text{-}2}$: Mushroom Production (lb/day) |

***The Regression-Discontinuity Research Design.*** The *Regression-Discontinuity Research* design is an expansion of the *Static-Group Comparison* pre-experimental design. It compares multiple rank-ordered groups with and without the treatment. A pre-treatment test is not used. However, a "phantom" pretest (signified by O) is assumed based on some criterion known to the researcher and upon which s/he makes the decision to treat or not treat the

| | | | |
|---|---|---|---|
| $G_1$ | O | X | $O_1$ |
| $G_2$ | O | X | $O_2$ |
| $G_3$ | O | X | $O_3$ |
| $G_4$ | O | X | $O_4$ |
| $G_5$ | O | X | $O_5$ |
| $G_6$ | O | | $O_6$ |
| $G_7$ | O | | $O_7$ |
| $G_8$ | O | | $O_8$ |
| $G_9$ | O | | $O_9$ |
| $G_{10}$ | O | | $O_{10}$ |

group. Because this design identifies differences among the groups at the outset, its long series of comparison groups helps the researcher rule out selection threats.

This design provides a cross-sectional examination of many groups all at the same time. The researcher has the opportunity to see how a variety of treated and non-treated groups differ.

## Selected Experimental Design

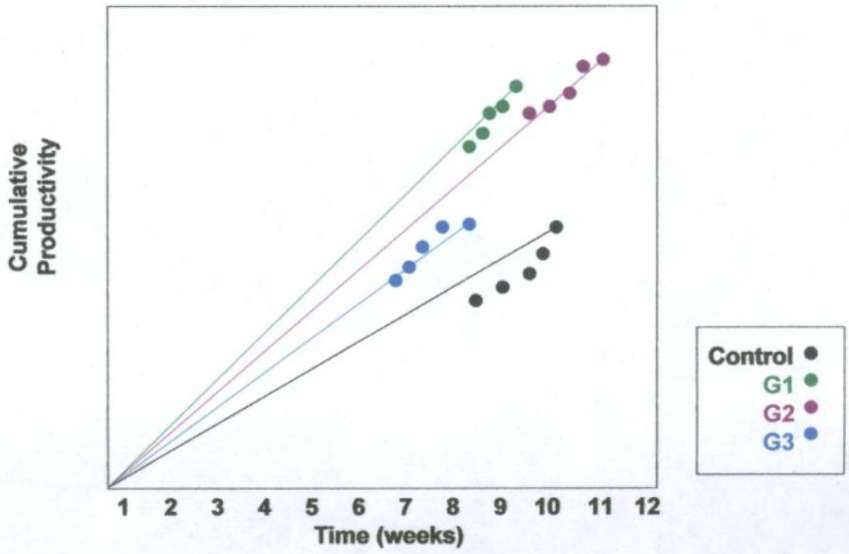
This research will combine elements of the Comparison Design and the Regression Discontinuity Design. Consistent with the Regression-Discontinuity design, there will be no pre-treatment test. A phantom pre-treatment test value of zero mushroom production will be assigned to all groups. Evaluation will then use non-equivalent group design to compare production rate (lbs/day) and duration (day) of each group.

### Threats to Validity

- Selection threats: Differences among experimental and control groups will be identified at the outset to eliminate selection threats.
- Environmental threats: Differences in the environment over time for each of the groups will be eliminated by minimizing the amount of time between preparation of successive groups, and monitoring and controlling $CO_2/O_2$, relative humidity, light, and temperature throughout successive stages of growth.

### Productivity Analysis

In order to assess economic viability as well as productivity, a cost-benefit of analysis quantity and quality vs. time will evaluated and for each group and compared. Productivity results will be measured as the product of mushroom weight and evaluation of their quality. These results will be plotted against time to provide an overall productivity relationship for each group. A sample graph is presented below.




Productivity (P) = Harvested Weight × Percent "Sellable"

Time (T) = Days from Inoculation

Criteria for evaluating quality are described below.

**Quality Criteria**

- % "Sellable"
  - 100% (1.0), 90% (0.9) etc.
    - Basis: Qualitative assessment of:
      - Size
      - Consistency
      - Moisture
      - Appearance

**Cost/Benefit Analysis**

Since economic feasibility is dependent upon productivity/quality, time to market, and production costs, we need to consider both the slope of the graph representing each group (this represents the production rate in lbs/day) and the associated average cost rate (cost/day).

The production rate is thus calculated as:

$PR_i = P_i \div T_i$ (slope) = production rate (lb/day)

To determine cost, we need to consider production time ($T_i$). We begin by determining:

- $T_i$: how long each group took to fruit (from substrate preparation to end of harvest in days).
- $C_i$: how many growth cycles per year can be attained for each group ($52 \div T_i$).
- $Cc_i$: cost per cycle (including material, energy, and labor costs)

The cost rate is thus calculated as:

$CR_i = Cc_i \div T_i$ ($/day)

And the cost/benefit ratio is calculated as:

$C/B_i = CRi \div PR_i$

These ratios will be compared to determine the most economically attractive alternatives.

# APPENDIX B: FORMULATION DEVELOPMENT

| Substrate Materials | Lignin | Cellulose | Hemi-Cellulose | Crude Protein |
|---|---|---|---|---|
| Sawdust, oak | 20 | 45 | 30 | 0 |
| Sawdust, maple | 20 | 45 | 30 | 0 |
| Sawdust, other | | | | |
| Corncob | 4.767 | 30.447 | 30.482 | 5.231 |
| Wheat straw | 7.918 | 41.511 | 22.737 | 5.409 |
| Oat straw | | | | |
| Brewer's grain | 6.152 | 17.35 | 26.678 | 25.955 |
| Cottonseed hulls | 23.718 | 41.328 | 14.609 | 8.359 |
| Cottonseed meal | 8.309 | 13.939 | 9.735 | 42.874 |
| | | | | |
| **Supplements** | | | | |
| Wheat bran | 4.155 | 10.18 | 26.65 | 17.635 |
| Rice bran | 12.619 | 9.309 | 11.543 | 13.36 |
| Oat bran | | | | |
| Millet | 0.000 | 6.467 | 8.009 | 13.471 |
| Beet pulp | 3.587 | 21.998 | 16.265 | 9.644 |
| Brewer's grain | 6.152 | 17.35 | 26.678 | 25.955 |
| Brewer's yeast | | | | |
| Grape pomace | 34.840 | 13.979 | 6.567 | 16.856 |
| Soybean meal | 1.373 | 7.069 | 4.658 | 51.264 |
| Corn distillers grain | 5.8 | 3.9 | 24.800 | 31.7 |

| | | | | | Source | |
|---|---|---|---|---|---|---|
| 59% oak sawdust & 15% millet & 15% brewer's grain & 10% wheat bran & 1% calcium carbonate | 13.1 | 31.1 | 37.1 | 7.7 | Dan Royse: *Effect of Brewer's Grain and Delayed Release Nutrient Supplementation on Yield and Size of* Pleurotus eryngii | BE=54.1 |

| | | | | |
|---|---|---|---|---|
| Royse control | 13.1 | 31.1 | 25.6 | 7.7 |
| Composite from below | 17.8 | 36.4 | 32.1 | 8.1 |
| Percentage difference | 35.1% | 16.9% | 25.4% | 5.1% |

| | | ALTERNATIVE SUBSTRATES DUPLICATING ROYSE | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Calculator | R1 - Royse lbs & % | R2 - Sawdust Organic & Local (lbs) | %ages | R3 - Corncob Local (lbs) | %ages | R4 - Wheat Straw Local (lbs) | %ages |
| Sawdust | 70.00 | 59 | 60.00 | 65.2% | 20.0 | 18.3% | 15 | 14.7% |
| Corncob | 0.00 | | 7.00 | 7.6% | 62.5 | 57.1% | 27 | 26.5% |
| Wheat straw | 0.00 | | | | | | 34 | 33.4% |
| Cottonseed hulls | 0.00 | | | | | | | |
| Wheat bran | 40.00 | 10 | 15.00 | 16.3% | | | | |
| Rice Bran | 0.00 | | | | | | | |
| Millet | 0.00 | 15 | | | 10.0 | 9.1% | | |
| Corn distiller's grain | 0.00 | | | | | | | |
| Beet pulp | 0.00 | | | | | | 2 | 2.0% |
| Brewer's grain | 0.00 | 15 | | | | | 9 | 8.8% |
| Brewer's yeast | 0.00 | 0 | | | | | | |
| Grape pomace | 6.00 | | | | 16.0 | 14.6% | 13.8 | 13.6% |
| Soybean meal | 0.00 | | 9.00 | 9.8% | | | | |
| calcium carbonate | 1.00 | 1 | 1.00 | 1.1% | 1.0 | 0.9% | 1 | 1.0% |
| calcium sulfate | 0.00 | | | | | | | |
| | 117.00 | 100 | 92.00 | 100.0% | 109.5 | 100.0% | 101.8 | 100.0% |
| | COMPONENT | % | % | | % | | % | |
| | Lignin | 13.1 | 13.1 | | 12.6 | | 12.4 | |
| | Cellulose | 31.1 | 31.3 | | 30.9 | | 33.0 | |
| | Hemi-Cellulose | 25.6 | 24.6 | | 26.9 | | 24.1 | |
| | Crude Protein | 7.7 | 7.6 | | 7.3 | | 8.1 | |

NOTE: Our strategy here is to create control groups for sawdust-based, wheatstraw-based, and corncob-based formulations by matching the fiber and protein content to Royse's sawdust-based formulation. Our rationale for using a sawdust-based formulation for wheat and corncob basal ingredients is that Royse's formulation came from the only study we found that used the CS 515 spawn as an inoculant.

| | Royse lbs & % | R5 - 50% lignin increase | | R6 - 35% lignin increase + 25% hemi-cellulose increase | | R7 - Royse + 1% sucrose | |
|---|---|---|---|---|---|---|---|
| Sawdust | 59 | 60 | 58.8% | 70 | 59.8% | 59 | 58.4% |
| Corncob | | 0 | 0.0% | 0 | 0.0% | | 0.0% |
| Wheat straw | | 0 | 0.0% | 0 | 0.0% | | 0.0% |
| Cottonseed hulls | | 0 | 0.0% | 0 | 0.0% | | 0.0% |
| Wheat bran | 10 | 20 | 19.6% | 40 | 34.2% | 10 | 9.9% |
| Rice Bran | | 0 | 0.0% | 0 | 0.0% | | 0.0% |
| Millet | 15 | 0 | 0.0% | 0 | 0.0% | 15 | 14.9% |
| Corn distiller's grain | | 0 | 0.0% | 0 | 0.0% | | 0.0% |
| Beet pulp | | 0 | 0.0% | 0 | 0.0% | | 0.0% |
| Brewer's grain | 15 | 0 | 0.0% | 0 | 0.0% | 15 | 14.9% |
| Brewer's yeast | | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| Grape pomace | | 21 | 20.6% | 6 | 5.1% | | 0.0% |
| Soybean meal | | 1 | 1.0% | 0 | 0.0% | | 0.0% |
| calcium carbonate | 1 | 0 | 0.0% | 1 | 0.9% | 1 | 1.0% |
| calcium sulfate | | 0 | 0.0% | 0 | 0.0% | | 0.0% |
| TOTAL | 100 | 102 | 100.0% | 117 | 100.0% | 1 | 1.0% |
| | | | | | | 101 | 100.0% |

< Sucrose

NOTE: Our strategy here is to vary specific substrate component percentages to correspond with reported successes.

| COMPONENT | % | % | | % | | % |
|---|---|---|---|---|---|---|
| Lignin | 13.1 | 20.2 | | 17.8 | | 13.1 |
| Cellulose | 31.1 | 32.2 | | 36.4 | | 31.1 |
| Hemi-Cellulose | 25.6 | 24.8 | | 32.1 | | 25.6 |
| Crude Protein | 7.7 | 7.6 | | 8.1 | | 7.7 |

# APPENDIX C: SUBSTRATE MOISTURE DETERMINATION

| | Initial Wt. (lb) | Final Wt. (lb) | Moisture Content (%) | Initial Wt. (lb)* | Final Wt. (lb)* | Moisture Content (%)* |
|---|---|---|---|---|---|---|
| Sawdust | 0.102 | 0.064 | 37.25% | 0.106 | 0.038 | 64.15% |
| Corn cob | 0.101 | 0.090 | 10.89% | 0.172 | 0.058 | 66.28% |
| Wheat straw (red) | 0.119 | 0.106 | 10.92% | 0.201 | 0.045 | 77.61% |
| Grape pomace | 0.100 | 0.047 | 53.00% | | | |
| Millet | 0.111 | 0.102 | 8.11% | | | |
| Brewer's grain | 0.107 | 0.029 | 72.90% | | | |
| Soybean meal | 0.108 | 0.100 | 7.41% | | | |
| Beet pulp | 0.108 | 0.098 | 9.26% | | | |
| Calcium carbonate | 0.108 | 0.108 | 0.00% | | | |
| Sucrose | 0.111 | 0.111 | 0.00% | | | |
| Wheat bran | 0.101 | 0.088 | 12.87% | | | |
| Bag | 0.023 | 0.023 | 0.00% | | | |

*after overnight soak

| | Physical Analysis | | | Calculated |
|---|---|---|---|---|
| | Initial Wt. (lb) | Final Wt. (lb) | Moisture Content (%) | Moisture Content (%) |
| R1-Royse | 0.106 | 0.037 | 65.09% | 59.80% |
| R2-Sawdust | 0.113 | 0.045 | 60.18% | 57.41% |
| R3-Corncob | 0.088 | 0.033 | 62.50% | 61.87% |
| R4-Wheat straw | 0.099 | 0.028 | 71.72% | 70.00% |
| R5-50% lignin increase | 0.103 | 0.040 | 61.17% | 56.79% |
| R6-35% lignin, 25% hemi-cellulose | 0.107 | 0.046 | 57.01% | 54.10% |
| R7-Royse + 1% sucrose | 0.116 | 0.047 | 59.48% | 59.55% |

## APPENDIX E: PRODUCTION WORKSHEET 2

| R1- Royse<br>Sawdust<br>Wheat bran<br>Millet<br>Brewer's grain<br>Calcium Carbonate | | | | R2 - Sawdust<br>Sawdust<br>Corncob<br>Wheat bran<br>Soybean meal<br>Calcium Carbonate | | | | R3 - Corncob<br>Sawdust<br>Corncob<br>Millet<br>Grape pomace<br>Calcium Carbonate | | | | R4 - Wheat straw (red)<br>Sawdust<br>Corncob<br>Wheat Straw<br>Beet pulp<br>Brewer's grain<br>Grape pomace<br>Calcium carbonate | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| date | harvest | sellable | comments | date | harvest | sellable | comments | date | harvest | sellable | comments | date | harvest | sellable | comments |
| 16-Aug | 0.000 | 0.000 | | 16-Aug | 0.000 | 0.000 | | 16-Aug | 0.000 | 0.000 | | 16-Aug | 0.874 | 0.874 | |
| 17-Aug | 0.000 | 0.000 | | 17-Aug | 0.000 | 0.000 | | 17-Aug | 0.599 | 0.581 | | 17-Aug | 1.209 | 1.171 | |
| 18-Aug | 0.000 | 0.000 | | 18-Aug | 1.845 | 1.844 | | 18-Aug | 0.284 | 0.273 | | 18-Aug | 0.359 | 0.359 | |
| 19-Aug | 0.000 | 0.000 | | 19-Aug | 0.432 | 0.432 | | 19-Aug | 0.224 | 0.224 | | 19-Aug | 0.000 | 0.000 | |
| 20-Aug | 0.741 | 0.610 | | 20-Aug | 1.727 | 1.705 | | 20-Aug | 0.625 | 0.604 | | 20-Aug | 0.245 | 0.245 | |
| 21-Aug | 1.490 | 1.490 | | 21-Aug | 0.834 | 0.834 | | 21-Aug | 0.439 | 0.439 | These have been producing fairly large caps. | 21-Aug | 0.132 | 0.132 | These have been producing large caps. |
| 22-Aug | 0.729 | 0.708 | | 22-Aug | 0.644 | 0.609 | | 22-Aug | 0.863 | 0.831 | | 22-Aug | 0.497 | 0.489 | |
| 23-Aug | 0.949 | 0.933 | | 23-Aug | 0.674 | 0.673 | | 23-Aug | 0.100 | 0.100 | | 23-Aug | 0.123 | 0.123 | |
| 24-Aug | 0.421 | 0.421 | | 24-Aug | 0.000 | 0.000 | | 24-Aug | 0.000 | 0.000 | | 24-Aug | 0.000 | 0.000 | |
| 25-Aug | 0.721 | 0.421 | | 25-Aug | 1.103 | 1.020 | | 25-Aug | 0.758 | 0.710 | | 25-Aug | 1.641 | 1.352 | |
| 26-Aug | 0.000 | 0.000 | | 26-Aug | 0.000 | 0.000 | | 26-Aug | 0.000 | 0.000 | | 26-Aug | 0.592 | 0.592 | |
| 27-Aug | 0.310 | 0.310 | | 27-Aug | 0.660 | 0.660 | | 27-Aug | 0.118 | 0.118 | | 27-Aug | 0.190 | 0.190 | |
| 28-Aug | 0.437 | 0.437 | | 28-Aug | 0.424 | 0.424 | | 28-Aug | 0.585 | 0.585 | | 28-Aug | 0.104 | 0.000 | |
| 29-Aug | 0.000 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day; also trimmed off rotting/water-logged/decaying mushrooms | 29-Aug | 1.275 | 0.906 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day; also trimmed off rotting/water-logged/decaying mushrooms | 29-Aug | 0.297 | 0.278 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day; also trimmed off rotting/water-logged/decaying mushrooms | 29-Aug | 0.045 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day; also trimmed off rotting/water-logged/decaying mushrooms |
| 30-Aug | 0.266 | 0.184 | | 30-Aug | 0.301 | 0.291 | | 30-Aug | 0.000 | 0.000 | | 30-Aug | 0.156 | 0.148 | |
| 31-Aug | | | | 31-Aug | | | | 31-Aug | | | | 31-Aug | | | |
| 1-Sep | | | | 1-Sep | | | | 1-Sep | | | | 1-Sep | | | |
| 2-Sep | | | | 2-Sep | | | | 2-Sep | | | | 2-Sep | | | |
| 3-Sep | | | | 3-Sep | | | | 3-Sep | | | | 3-Sep | | | |
| 4-Sep | | | | 4-Sep | | | | 4-Sep | | | | 4-Sep | | | |

| R6 - 35% lignin increase + 25% hemi-cellulose increase | Dry Weight (%) | Moisture (%) | Wet Weight (lb) | Adjusted Wet Weight (lb) | Adjusted Dry Weight (lb) | Adjusted Dry Weight (%) | Adjusted Total Moisture (%) | SOAK (lb) | "Batch One": (15 bags - within 1/10 of 5 lbs) Inoculated 7/17 with 1/2 cup Pleurotus eryngii from NMC: CS-515, batch #2235 unit#13. Opened all 15 bags on 8/11 - significant growth at top. | "Batch Two": (16 bags - within 1/10 of 5 lbs, 1 bag for control). The mixture seemed a little on the dry side. Despite this, a moisture content analysis was not performed. Perhaps lost moisture due to drained sawdust tank sitting in sun in between mixings. Inoculated 7/28 with 1/2 cup Pleurotus eryngii from NMC: CS-515, batch #2235 unit#8. |
|---|---|---|---|---|---|---|---|---|---|---|
| Sawdust | 59.80 | 64.15% | 166.81 | 62.01 | 22.23 | 59.80% | | 35.43 | | |
| Wheat bran | 34.20 | 12.87% | 39.25 | 14.59 | 12.71 | 34.20% | | | | |
| Grape pomace | 5.10 | 53.00% | 10.85 | 4.03 | 1.90 | 5.10% | | | | |
| Soybean meal | 0.90 | 7.41% | 0.97 | 0.36 | 0.33 | 0.90% | | | | |
| **Total** | **100.00** | | **217.88** | **81.00** | **37.18** | **100.00%** | **54.10%** | | | |
| | | | Target Weight: | 81.00 | | | | | | |

| R7 - Royse + 1% sucrose | Dry Weight (%) | Moisture (%) | Wet Weight (lb) | Adjusted Wet Weight (lb) | Adjusted Dry Weight (lb) | Adjusted Dry Weight (%) | Adjusted Total Moisture (%) | SOAK (lb) | "Batch One": (15 bags - within 1/10 of 5 lbs) Inoculated 7/17 with 1/2 cup Pleurotus eryngii from NMC: CS-515, batch #2235 unit#13. Opened all 15 bags on 8/11 - very significant growth at top of bags. | "Batch Two": (16 bags - within 1/10 of 5 lbs, 1 bag for control). The mixture seemed a little on the dry side. Despite this, a moisture content analysis was not performed. Perhaps lost moisture due to drained sawdust tank sitting in sun in between mixings. Inoculated 7/28 with 1/2 cup Pleurotus eryngii from NMC: CS-515, batch #2235 unit #8 (11 bags) and unit #15 (4 bags marked with ' * '). Note: |
|---|---|---|---|---|---|---|---|---|---|---|
| Sawdust | 58.40 | 64.15% | 162.90 | 53.32 | 19.12 | 58.34% | | 30.46 | | |
| Wheat bran | 9.90 | 12.87% | 11.36 | 3.72 | 3.24 | 9.89% | | | | |
| Millet | 14.90 | 8.11% | 16.22 | 5.31 | 4.88 | 14.89% | | | | |
| Brewer's grain | 14.90 | 72.90% | 54.98 | 18.00 | 4.88 | 14.89% | | | | |
| Calcium carbonate | 1.00 | 0.00% | 1.00 | 0.33 | 0.33 | 1.00% | | | | |
| Sucrose | 1.00 | 0.00% | 1.00 | 0.33 | 0.33 | 1.00% | | | | |
| **Total** | **100.10** | | **247.46** | **81.00** | **32.77** | **100.00%** | **59.55%** | | | |
| | | | Target Weight: | 81.00 | | | | | | |

| R5 - 50% lignin increase<br><br>Sawdust<br>Wheat bran<br>Grape pomace<br>Soybean meal | | | | R6 - 35% lignin increase + 25% hemi-cellulose increase<br><br>Sawdust<br>Wheat bran<br>Grape pomace<br>Soybean meal | | | | R7 - Royse + 1% sucrose<br><br>Sawdust<br>Wheat bran<br>Millet<br>Brewer's grain<br>Calcium carbonate<br>Sucrose | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **date** | **harvest** | **sellable** | **comments** | **date** | **harvest** | **sellable** | **comments** | **date** | **harvest** | **sellable** | **comments** |
| 16-Aug | 0.000 | 0.000 | | 16-Aug | 0.000 | 0.000 | | 16-Aug | 3.711 | 3.520 | |
| 17-Aug | 0.000 | 0.000 | | 17-Aug | 0.000 | 0.000 | | 17-Aug | 5.577 | 5.357 | |
| 18-Aug | 0.483 | 0.443 | | 18-Aug | 0.945 | 0.943 | | 18-Aug | 9.112 | 7.892 | |
| 19-Aug | 0.000 | 0.000 | | 19-Aug | 0.000 | 0.000 | | 19-Aug | 0.000 | 0.000 | |
| 20-Aug | 0.128 | 0.128 | | 20-Aug | 2.340 | 0.000 | These are highly deformed with bulbous stems and small caps. | 20-Aug | 0.060 | 0.060 | |
| 21-Aug | 0.587 | 0.581 | These are highly deformed with bulbous stems and small caps. | 21-Aug | 0.118 | 0.118 | | 21-Aug | 0.000 | 0.000 | |
| 22-Aug | 1.101 | 1.083 | These are highly deformed with bulbous stems and small caps. | 22-Aug | 1.227 | 1.227 | | 22-Aug | 0.154 | 0.154 | |
| 23-Aug | 1.233 | 1.195 | Bubous stems. | 23-Aug | 2.044 | 2.044 | Stems are heavy. | 23-Aug | 0.000 | 0.000 | |
| 24-Aug | 0.000 | 0.000 | | 24-Aug | 0.000 | 0.000 | | 24-Aug | 0.000 | 0.000 | |
| 25-Aug | 1.030 | 1.005 | | 25-Aug | 1.611 | 1.449 | | 25-Aug | 0.000 | 0.000 | |
| 26-Aug | 0.000 | 0.000 | | 26-Aug | 0.000 | 0.000 | | 26-Aug | 0.000 | 0.000 | |
| 27-Aug | 0.000 | 0.000 | These are yellow, very wet and appear to be done. | 27-Aug | 0.093 | 0.093 | | 27-Aug | 0.213 | 0.213 | |
| 28-Aug | 0.275 | 0.269 | | 28-Aug | 0.099 | 0.099 | | 28-Aug | 0.487 | 0.467 | |
| 29-Aug | 0.000 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day; also trimmed off rotting/water-logged/decaying mushrooms | 29-Aug | 0.000 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day; also trimmed off rotting/water-logged/decaying mushrooms | 29-Aug | 0.000 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day; also trimmed off rotting/water-logged/decaying mushrooms |
| 30-Aug | 0.000 | 0.000 | | 30-Aug | 0.000 | 0.000 | | 30-Aug | 0.068 | 0.000 | 1 mushroom growing in btwn rack |
| 31-Aug | | | | 31-Aug | | | | 31-Aug | | | |
| 1-Sep | | | | 1-Sep | | | | 1-Sep | | | |
| 2-Sep | | | | 2-Sep | | | | 2-Sep | | | |
| 3-Sep | | | | 3-Sep | | | | 3-Sep | | | |
| 4-Sep | | | | 4-Sep | | | | 4-Sep | | | |

| R1b- Royse | | | |
|---|---|---|---|
| date | harvest | sellable | comments |
| 27-Aug | 0.252 | 0.252 | |
| 28-Aug | 0.461 | 0.421 | |
| 29-Aug | 0.000 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day |
| 30-Aug | 0.000 | 0.000 | |
| 31-Aug | | | |
| 1-Sep | | | |
| 2-Sep | | | |
| 3-Sep | | | |

| R2b - Sawdust | | | |
|---|---|---|---|
| date | harvest | sellable | comments |
| 27-Aug | 0.000 | 0.000 | |
| 28-Aug | 0.000 | 0.000 | |
| 29-Aug | 0.879 | 0.879 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day |
| 30-Aug | 0.340 | 0.300 | |
| 31-Aug | | | |
| 1-Sep | | | |
| 2-Sep | | | |
| 3-Sep | | | |

| R3b - Corncob | | | |
|---|---|---|---|
| date | harvest | sellable | comments |
| 27-Aug | 0.000 | 0.000 | |
| 28-Aug | 0.305 | 0.305 | |
| 29-Aug | 0.000 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day |
| 30-Aug | 0.961 | 0.923 | |
| 31-Aug | | | |
| 1-Sep | | | |
| 2-Sep | | | |
| 3-Sep | | | |

| R4b - Wheat straw (red) | | | |
|---|---|---|---|
| date | harvest | sellable | comments |
| 27-Aug | 0.000 | 0.000 | |
| 28-Aug | 1.404 | 1.401 | |
| 29-Aug | 0.784 | 0.717 | Cut misting by 50% -> now w on 1/2 hr every 6 hours for a of 2 hr/day |
| 30-Aug | 0.116 | 0.116 | |
| 31-Aug | | | |
| 1-Sep | | | |
| 2-Sep | | | |
| 3-Sep | | | |

| R5b - 50% lignin increase | | | |
|---|---|---|---|
| date | harvest | sellable | comments |
| 27-Aug | 0.000 | 0.000 | |
| 28-Aug | 0.000 | 0.000 | |
| 29-Aug | 0.000 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day |
| 30-Aug | 0.000 | 0.000 | |
| 31-Aug | | | |
| 1-Sep | | | |
| 2-Sep | | | |
| 3-Sep | | | |

| R6b - 35% lignin increase + 25% hemi-cellulose increase | | | |
|---|---|---|---|
| date | harvest | sellable | comments |
| 27-Aug | 0.000 | 0.000 | |
| 28-Aug | 0.000 | 0.000 | |
| 29-Aug | 0.000 | 0.000 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day |
| 30-Aug | 0.000 | 0.000 | |
| 31-Aug | | | |
| 1-Sep | | | |
| 2-Sep | | | |
| 3-Sep | | | |

| R7b - Royse + 1% sucrose | | | |
|---|---|---|---|
| date | harvest | sellable | comments |
| 27-Aug | 1.052 | 0.252 | |
| 28-Aug | 0.350 | 0.000 | |
| 29-Aug | 0.175 | 0.175 | Cut misting by 50% -> now water on 1/2 hr every 6 hours for a total of 2 hr/day |
| 30-Aug | 0.000 | 0.000 | |
| 31-Aug | | | |
| 1-Sep | | | |
| 2-Sep | | | |
| 3-Sep | | | |

| R4 - Wheat straw (red) | Dry Weight (%) | Moisture (%) | Wet Weight (lb) | Adjusted Wet Weight (lb) | Adjusted Dry Weight (lb) | Adjusted Dry Weight (%) | Adjusted Total Moisture (%) | SOAK (lb) |
|---|---|---|---|---|---|---|---|---|
| awdust | 14.70 | 64.15% | 41.00 | 9.96 | 3.57 | 14.70% | | 5.69 |
| orncob | 26.50 | 66.28% | 78.59 | 19.09 | 6.44 | 26.50% | | 7.23 |
| Wheat Straw | 33.40 | 77.61% | 149.17 | 36.24 | 8.12 | 33.40% | | 9.11 |
| eet pulp | 2.00 | 9.26% | 2.20 | 0.54 | 0.49 | 2.00% | | |
| rewer's grain | 8.80 | 72.90% | 32.47 | 7.89 | 2.14 | 8.80% | | |
| Grape pomace | 13.60 | 53.00% | 28.94 | 7.03 | 3.30 | 13.60% | | |
| alcium carbonate | 1.00 | 0.00% | 1.00 | 0.24 | 0.24 | 1.00% | | |
| otal | 100.00 | | 333.38 | 81.00 | 24.30 | 100.00% | 70.00% | |
| | | | Target Weight: | 81.00 | | | | |

"Batch One": Consider making formula in two separate "batches". One full batch (75 lb) filled the mixer, making it difficult to thoroughly mix substrate materials. Therefore, there is a concern with the first "round" that the total mixture was not homogenous. (15 bags - within 1/10 of 5 lbs). Inoculated 7/14 with 1/2 cup Pleurotus eryngii from Northwest Mycological Consultants: CS-515, batch # 2235 unit #10. Opened 11 bags on 8/11. Opened remaing 4 bags on 8/14

"Batch Two": Mixed in two separate "batches". (16 bags - withing 1/10 of 5 lbs, 1 bag for control). Inoculated 7/26 with approx. 1/2 cup Pleurotus eryngii from Northwest Mycological Consultants: CS-515, batch # 2235 unit #11 (15 bags). Used 1 bag for control (i.e. did not inoculate).

| R5 - 50% lignin increase | Dry Weight (%) | Moisture (%) | Wet Weight (lb) | Adjusted Wet Weight (lb) | Adjusted Dry Weight (lb) | Adjusted Dry Weight (%) | Adjusted Total Moisture (%) | SOAK (lb) |
|---|---|---|---|---|---|---|---|---|
| awdust | 58.80 | 64.15% | 164.02 | 57.41 | 20.58 | 58.80% | | 32.80 |
| Wheat bran | 19.60 | 12.87% | 22.50 | 7.87 | 6.86 | 19.60% | | |
| Grape pomace | 20.60 | 53.00% | 43.83 | 15.34 | 7.21 | 20.60% | | |
| Soybean meal | 1.00 | 7.41% | 1.08 | 0.38 | 0.35 | 1.00% | | |
| otal | 100.00 | | 231.42 | 81.00 | 35.00 | 100.00% | 56.79% | |
| | | | Target Weight: | 81.00 | | | | |

"Batch One": (15 bags -within 1/10 of 5 lbs) Inoculated 7/17 with 1/2 cup Pleurotus eryngii from NMC: CS-515, batch #2235 unit#13. Opened 14 bags on 8/11 (threw out 1 moldy block) - signifcant growth at top.

"Batch Two": (16 bags - within 1/10 of 5 lbs, 1 bag for control). The mixture seemed a little on the dry side. Despite this, a moisture content analysis was not performed. Perhaps lost moisture due to drained sawdust tank sitting in sun in between mixings. Inoculated 7/28 with 1/2 cup Pleurotus eryngii from NMC: CS-515, batch #2235 unit#8.

## APPENDIX D: PRODUCTION WORKSHEET 1

| R1- Royse | Dry Weight (%) | Moisture (%) | Wet Weight (lb) | Adjusted Wet Weight (lb) | Adjusted Dry Weight (lb) | Adjusted Dry Weight (%) | Adjusted Total Moisture (%) | SOAK (lb) |
|---|---|---|---|---|---|---|---|---|
| Sawdust | 59.00 | 64.15% | 164.57 | 53.60 | 19.21 | 59.00% | | 30.62 |
| Wheat bran | 10.00 | 12.87% | 11.48 | 3.74 | 3.26 | 10.00% | | |
| Millet | 15.00 | 8.11% | 16.32 | 5.32 | 4.88 | 15.00% | | |
| Brewer's grain | 15.00 | 72.90% | 55.35 | 18.03 | 4.88 | 15.00% | | |
| Calcium Carbonate | 1.00 | 0.00% | 1.00 | 0.33 | 0.33 | 1.00% | | |
| **Total** | **100.00** | | **248.73** | **81.00** | **32.57** | **100.00%** | **59.80%** | |
| | | | Target Weight: | 81.00 | | | | |

"Batch One": Volume per bag similar to sawdust formulation. When taping bags closed, two folds were made. (15 bags - within 1/100 of 5 lbs., last bag (#15) was on the light side - approximately 4.4 lb) Inoculated 7/14 with 1/2 cup Pleurotus eryngii from Northwest Mycological Consultants: CS-515, batch # 2235 unit #10 (8 bags) & unit # 15 (7 bags). "Batch One": Opened 12 bags on 8/14. The remaiing bags were open on 8/22.

"Batch Two": (16 bags - within 1/10 of 5 lbs., 1 bag for control). Inoculated 7/26 with approx. 1/2 cup Pleurotus eryngii from Northwest Mycological Consultan CS-515, batch # 2235 unit #9 (all 16 bags - forgot to use one for control).

| R2 - Sawdust | Dry Weight (%) | Moisture (%) | Wet Weight (lb) | Adjusted Wet Weight (lb) | Adjusted Dry Weight (lb) | Adjusted Dry Weight (%) | Adjusted Total Moisture (%) | SOAK (lb) |
|---|---|---|---|---|---|---|---|---|
| Sawdust | 65.20 | 64.15% | 181.87 | 62.74 | 22.49 | 65.20% | | 35.84 |
| Corncob | 7.60 | 66.28% | 22.54 | 7.78 | 2.62 | 7.60% | | 2.94 |
| Wheat bran | 16.30 | 12.87% | 18.71 | 6.45 | 5.62 | 16.30% | | |
| Soybean meal | 9.80 | 7.41% | 10.58 | 3.65 | 3.38 | 9.80% | | |
| Calcium Carbonate | 1.10 | 0.00% | 1.10 | 0.38 | 0.38 | 1.10% | | |
| **Total** | **100.00** | | **234.80** | **81.00** | **34.50** | **100.00%** | **57.41%** | |
| | | | Target Weight: | 81.00 | | | | |

"Batch One": Volume per bag less than corncob formulation. When taping bags closed, two folds were made. (15 bags - within 1/10 of 5 lbs., last bag (#15) was on the light side - approximately 4.109 lb.) Inoculated 7/14 with 1/2 cup Pleurotus eryngii from Northwest Mycological Consultants: CS-515, batch # 2235 unit #10. Opened 13 bags on 8/14. The remaiing bags were open on 8/22.

"Batch Two": (16 bags - within 1/10 of 5 lbs., 1 bag for control). Inoculated 7/26 with approx. 1/2 cup Pleurotus eryngii from Northwest Mycological Consultan CS-515, batch # 2235 unit #9 (all 16 bags - forgot to use one for control).

| R3 - Corncob | Dry Weight (%) | Moisture (%) | Wet Weight (lb) | Adjusted Wet Weight (lb) | Adjusted Dry Weight (lb) | Adjusted Dry Weight (%) | Adjusted Total Moisture (%) | SOAK (lb) |
|---|---|---|---|---|---|---|---|---|
| Sawdust | 18.30 | 64.15% | 51.05 | 15.77 | 5.65 | 18.30% | | 9.01 |
| Corncob | 57.10 | 66.28% | 169.34 | 52.30 | 17.64 | 57.10% | | 19.79 |
| Millet | 9.10 | 8.11% | 9.90 | 3.06 | 2.81 | 9.10% | | |
| Grape pomace | 14.60 | 53.00% | 31.06 | 9.59 | 4.51 | 14.60% | | |
| Calcium Carbonate | 0.90 | 0.00% | 0.90 | 0.28 | 0.28 | 0.90% | | |
| **Total** | **100.00** | | **262.25** | **81.00** | **30.89** | **100.00%** | **61.87%** | |
| | | | Target Weight: | 81.00 | | | | |

"Batch One": Volume per bag was somewhat less and more managable than the wheat straw formulation. When taping bags closed, two folds were made. (14 bags - within 1/10 of 5 lbs, missing 5 lbs???? - ie no #15) Inoculated 7/14 with 1/2 cup Pleurotus eryngii from Northwest Mycological Consultants: CS-515, batch # 2235 unit #10. Opened 8 bags on 8/11 (threw out 1 moldy block). Opened remaing 6 bags on 8/14.

"Batch Two": (16 bags - within 1/10 of 5 lbs., 1 bag for control). Inoculated 7/26 with approx. 1/2 cup Pleurotus eryngii from Northwest Mycological Consultan CS-515, batch # 2235 unit #9 (10 bags and unit #11 (5 bags). Used 1 bag for control (i.e. did not inoculate).

# APPENDIX F: REVISED PROJECT SCHEDULE

| Task | Task Name | Start | End | Duration |
|---|---|---|---|---|
| 1 | Research & Feasibility Study Design | 5/22/2006 | 6/2/2006 | 10d |
| 2 | Process Design | 5/29/2006 | 7/14/2006 | 35d |
| 3 | Substrate, Supplement and Spawn Procurement | 5/29/2006 | 7/14/2006 | 35d |
| 4 | Substrate Preparation | 7/17/2006 | 8/18/2006 | 25d |
| 5 | Production | 7/21/2006 | 9/14/2006 | 40d |
| 6 | Product assessment | 7/26/2006 | 9/19/2006 | 40d |
| 7 | Economic analysis | 9/20/2006 | 10/3/2006 | 10d |
| 8 | Business Plan | 10/2/2006 | 10/13/2006 | 10d |
| 9 | Final Report | 10/9/2006 | 10/27/2006 | 15d |
| 10 | Information Dissemination | 10/9/2006 | 10/27/2006 | 15d |
| 11 | Farm Tours | 10/9/2006 | 10/27/2006 | 15d |