Project No. 80-X2
(Continuation of Project No. 79ZA)

Cooperator:
California State University
Department of Agricultural Industry and Education
Fresno, California 93740

Project Leader: Dr. Joo I. Kim Phone (209) 487-2681 or 487-1226

Project: Brush Utilization
Mushroom Compost

Objectives: (1) To study the feasibility of using ground almond brush as a compost for mushroom growing; (2) to investigate economical factors of utilizing ground almond brush as mushroom compost media.

Progress: Almond prunings may be an excellent mushroom growing media since mushrooms need cellulose, lignin and other organic compounds that are constituents of almond wood. It is necessary to investigate the composition of almond prunings to determine if there are any harmful chemicals such as terpene, which would inhibit mushroom growth.

Approximately 500,000 tons of almond prunings are produced in California annually. It is estimated that even if mushrooms are produced at the current rate, about 400,000 tons of these prunings could be utilized for composts that contain only 50 percent almond wood.

This project will only be undertaken if the chemical analyses of almond brush show favorable results. (Project No. 79-ZA)

Plans: Ground almond brush will be field cured and prepared compost will be used to grow mushrooms under commercial growing conditions and in a laboratory controlled atmosphere. Different formulas will be used to mix with ground almond brush. Growth characteristics and overall yield studies will be made and compared with results obtained from the regular compost media.

Economical formulas will be used to mix with ground almond brush.

Almond Industry Participation $8,865

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January 5, 1981

Mr. Robert K. Curtis
Associate Research Director
Almond Board of California
P. O. Box 15920
Sacramento, California 95813

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ALMOND BOARD

Dear Bob:

Attached is the annual report on "Almond Brush Utilization/ Mushroom Compost."

This study includes findings in:

Phase I - Analysis of almond branch composition.

Phase II - Study the feasibility of using almond brush as a mushroom compost media.

Sincerely,

Joo I. Kim, Ph.D.
Mushroom Project Director
Professor of Mechanized Agriculture

JIK:bf

Attach.

OBJECTIVES

1. Analyze chemical composition of nonpareil almond brush to determine if pruned brushes are potentially suitable as mushroom compost media (Phase I).
2. Study the feasibility of using ground almond brushes as a compost for mushroom growing (Phase II).

INTERPRETIVE SUMMARY

Chemical analyses of almond brush (Phase I) showed the favorable results, i.e., contains a large quantity of lignin, cellulose, and pentasans, which are essential elements for mushroom growing and has very little turpenes that are considered fungi inhibitor.

Therefore, Phase II was proceeded to determine almond brushes composting characteristics, spawn growth behavior and suitability for mushroom growings.

Experimental results indicated that composting process (field curing process) took a 30 percent longer period than traditional straw compost and there was also reductions in yield (21 percent commercial farm experiment and 12 percent university experiment) compare to controls.

However, this reduction in yield was expected as almond brush was never used to grown mushroom (Agaricus Bisporus) and neither composting techniques nor composting formulas based on almond brush were ever developed.

It is proposed that Phase III, development of composting techniques and formulas based on almond brush, be studied to complete this project as Phases I and II results are positive.

EXPERIMENTAL PROCEDURE

Phase I. See attached test results

Phase II.

Composting.

Three inch screened ground almond brushes were composted at the commercial mushroom farm, Del Norte Foods, Inc., Oxnard, in the following composition and manner:

Almond Brush Mushroom Compost Weight Ratio (%)

Almond Brush	75.66
Gypsum	5.67
Lime	.38
Cotton Seed Meal	8.87
Cotton Hull	1.26
Chicken Manure	8.16

Almond Brush Mushroom Compost Field Curing Procedure

Date	Action	Almond Brush & Supplements	Water & Speed
7/29/80	Weight out and dip	Almond brush total = 31790 lbs	3500 gal water added
7/30	Turn)))	3,788 lbs cotton seed meal 3,582 lbs chicken manure 527 lbs cottonhull	
8/2	Turn))	2,263 lbs gypsum 152 lbs lime	
8/6	Turn		water sprayed
8/9	Turn		
8/12	Turn		
8/16	Turn		
8/19	Turn		water sprayed
8/22	Turn		water sprayed
8/25	Turn		
8/27	Fill		

PASTEURIZATION

Composted almond brush was filled in the 4'x4' tray and pasteurized in peak-heating room at the temperature of 140°F by steam. This process eliminated all harmful organisms.

SPAWING AND CASING

Having pasteurized, mushroom spawn was inoculated for mushroom mycelium to grown. When mycelium was fully grown all over the compost three weeks later, 120 trays with almond brush compost were cased with casing soil (peat moss + lime).

MUSHROOM HARVESTING

First flush appeared approximately three weeks after casing and harvested for the period of six weeks. The harvested amount of each flush is shown in "RESULTS" of this report.

RESULTS

Phase I.

The following result shows the analysis of almond brush composition (page 4).

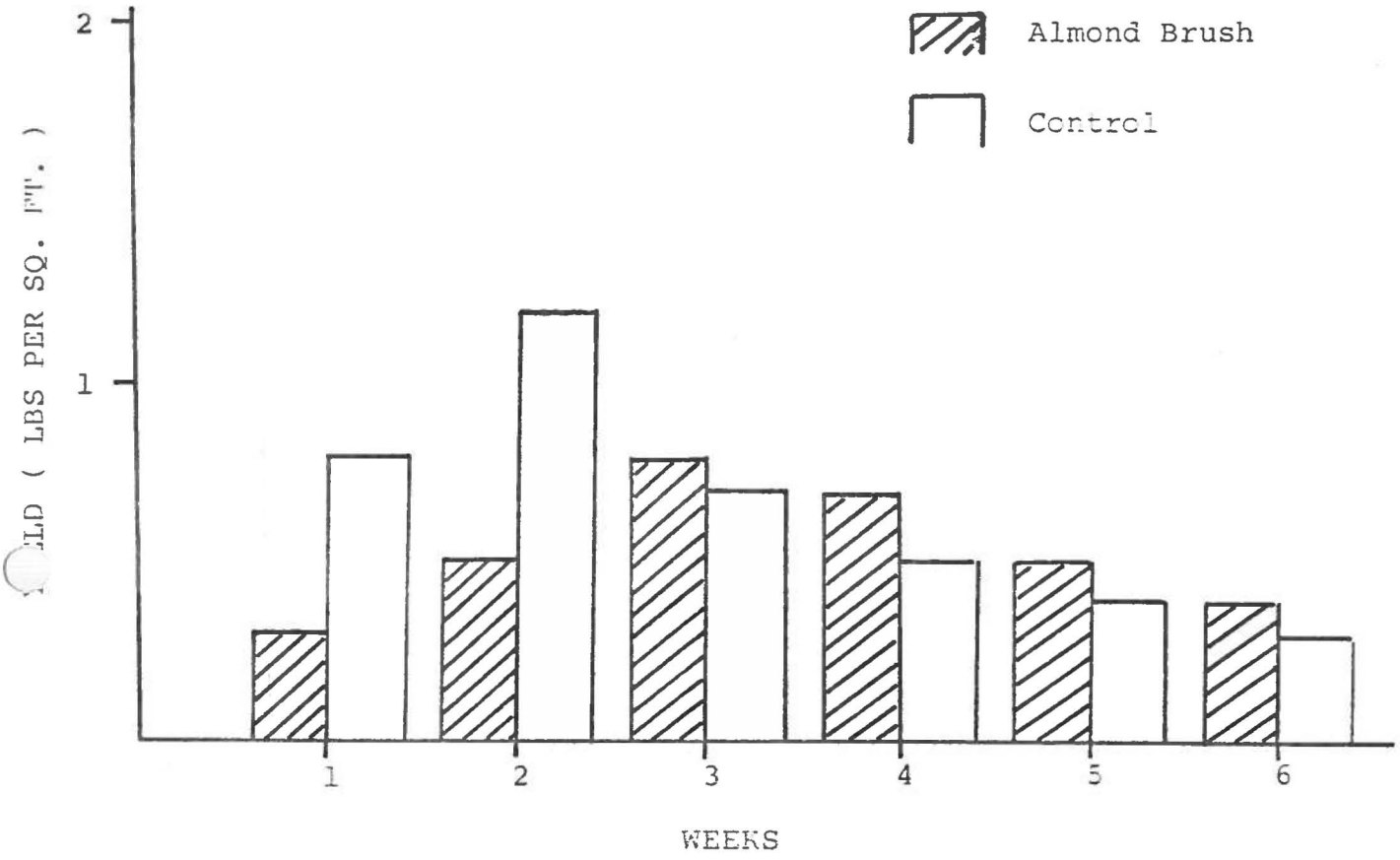
ANALYTICAL RESULTS OF ALMOND BRUSH COMPOSITION

	% in Sample Source			Method Used
	Fresh Wood	Air Dry	Oven Dry	
Potassium	0.56 ± 0.02	0.62 ± 0.02	0.83 ± 0.03	Atomic Absorption
Nitrogen	0.53	0.58	0.78	Kjeldahl
Turpenes	0.14 ± 0.003	0.16 ± 0.004	0.21 ± 0.005	Steam Distillation and Extraction
Ash	2.4	2.62	3.5	600°C
Lignin	17.48 ± 0.48	19.28 ± 0.52	25.70 ± 0.70	Sulfuric Acid Method
Cellulose	49.71 ± 0.75	54.82 ± 0.82	73.1 ± 1.1	Extraction and Chlorination
Moisture	31.95 ± 1.05	23.96 ± 0.79	00.0 ± 0.0	Oven 105°C and Air Dry
Acetic Acid	$3.73 \times 10^{-4} \pm 4.08 \times 10^{-6}$	$4.11 \times 10^{-4} \pm 4.5 \times 10^{-6}$	$5.48 \times 10^{-4} \pm 6.00 \times 10^{-6}$	Gas Chromatography
Pentosans*	25.50 ± 0.31	28.05 ± 0.34	37.31 ± 0.45	Volumetric Bromate-Bromide Method and Orcinol Colorimetric Method
Cyanide	<10ppm	<10ppm	<10ppm	Gas Chromatography Limit of 1ppm for Extraction Solution and 10ppm for Sample by Formation of Cyanogen Bromide

*The pentosans are part of the cellulose fraction.

Phase II.

Comparison results between almond brush compost and controls are shown in the following figure:



DISCUSSION

Ground almond brush can be used as a compost for mushroom growing. However, it requires development of composting techniques and unique composition formula (Phase III) to utilize this lignin, cellulose, and pentosans rich almond brush to produce higher mushroom yield.