Four Season Mushroom Farm

Field & Forest Products

Introduction:
Field & Forest Products, Inc

- Peshtigo, WI.
- Est. August 1983

Field & Forest Products' 4 Season Mushroom Farm Workflow

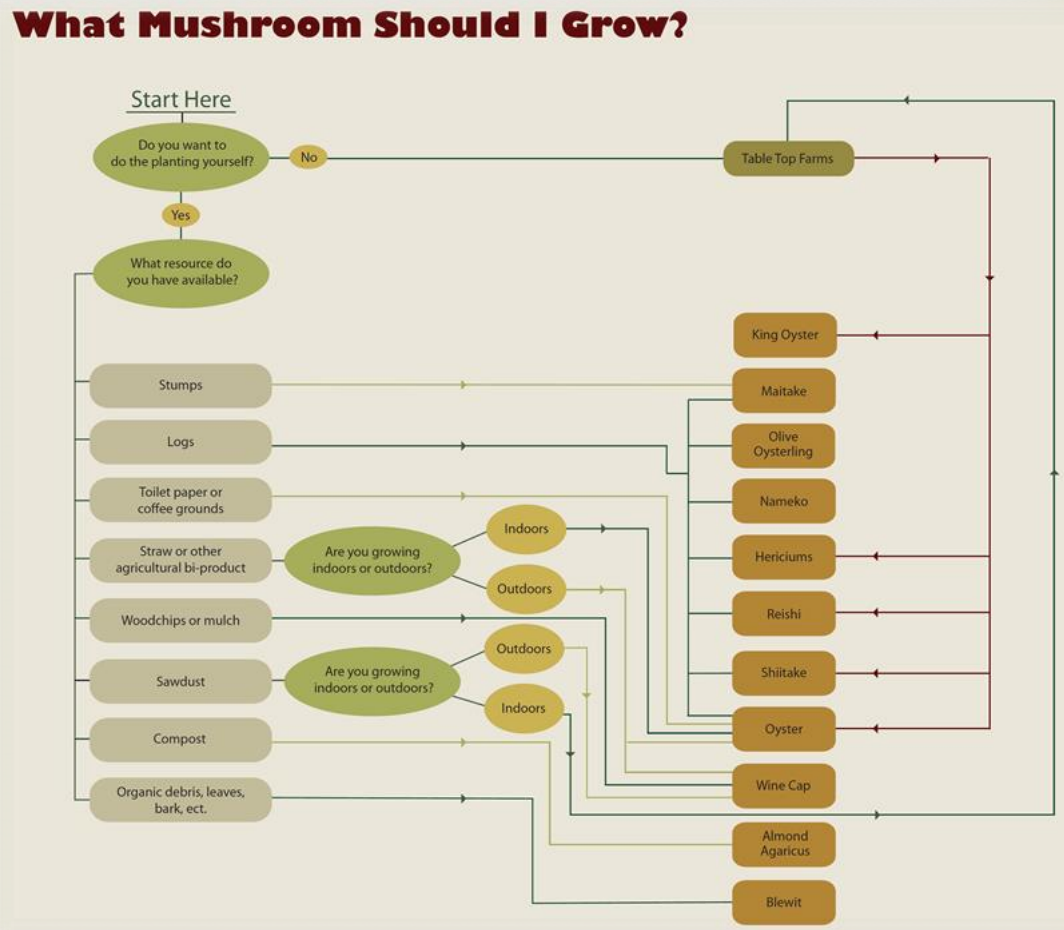
How intensive do you want your farm to be?

- Pleasant Hill Farm, Nova Scotia
- Cherry Tree House Mushroom, MN
- Sugarbee, WI
- Ozark Forest Mushrooms, MO

General Cultivation Overview:

- **Select a mushroom**
- Acquire appropriate spawn type
- Acquire & treat the substrate
- Inoculate
- Spawn run
- Pin initiation
- Fruiting

General Cultivation Overview:
Selecting a Mushroom



General Cultivation Overview: Selecting a Mushroom

- Selecting a mushroom depends on:

Facility:

- Indoor
- Outdoor
- Hoophouse/ Greenhouse

Substrate:

- Logs
- Blocks
- Straw
- Compost
- Wood chips

Seasonality:

- Spring
- Summer
- Fall
- Winter

*****You can achieve 4 season mushroom production by utilizing various substrates and a combination of indoor/outdoor production of many mushrooms**

Wood Chip / Straw Beds

Outdoor Production

Mushroom	Substrate	Strain	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Wine Cap	Woodchips													
	Straw													

Woodchip/Straw Beds:
Wine Cap

Straw Beds

- Fall plant
- Spring Production

Wood chips

Layered w/ Straw

Woodchip/Straw Beds:
Wine Cap

<u>Potential disease suppression</u>

<u>Sawdust spawn</u>

<u>Peg spawn</u> –super easy for this

Harvesting

- Harvest young for markets
- Harvest anytime for your home garden

Marketing

Bee Well

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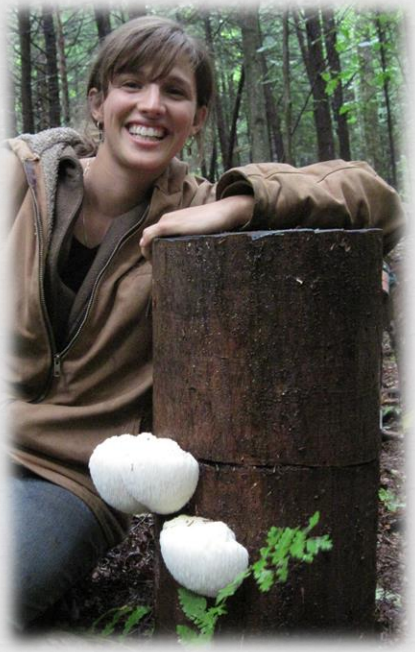
Log Production

Olive Oysterling

Maitake

Nameko

Oyster



Lion's Mane

Shiitake

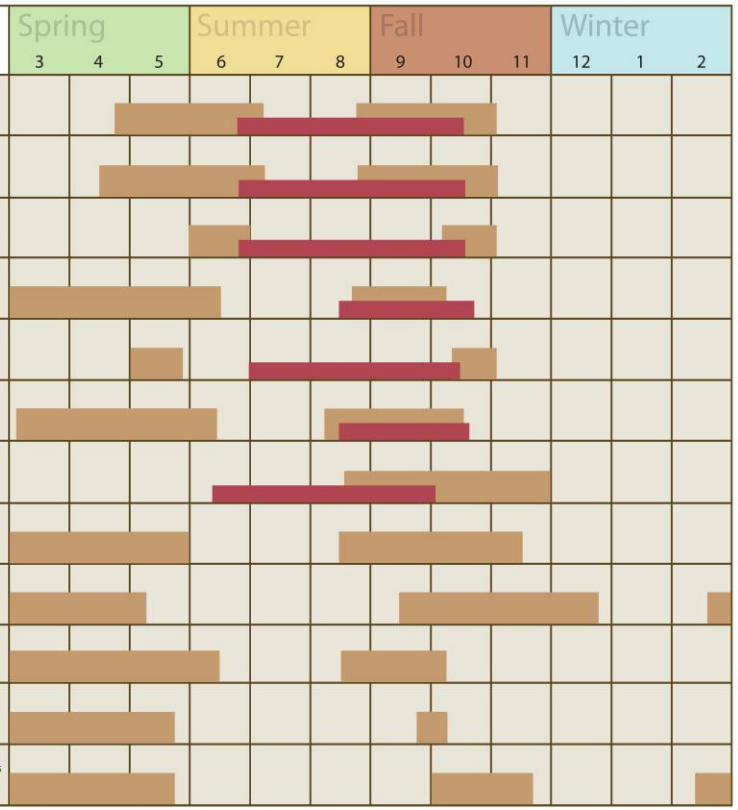
Cherry Tree House Mushrooms, Minneapolis, MN

- Shiitake Log Operation

Shiitake on Logs

Shiitake Strain Chart

Strain Divisions and Characteristics	Strain Name	Image	Fruiting Temperatures*	Additional Details
Wide Range •Best for beginners and for year-round commercial cultivation •Fastest spawn run, time to first fruit 6-12months •General temperature range 55-75°F •Can be force fruited for year round production if the above fruiting temps are provided •Mushroom quality and yield will be depressed in high heat and humidity	WR46		55-75°F	•Does best under cool nights and warm days such as found in high elevations •Short rests between fruitings in young logs •Quality can suffer with high humidity
	West Wind		59-77°F	• Often better than other wide range strains in drought conditions •Short rests between fruitings in newer logs
	Double Jewel		55-75°F	• Best production with cool nights and warm days • Tolerates humidity better than other wide range strains
	Native Harvest		45-75°F	• Abundant natural fruiting in late summer through fall, also responds best to forced fruiting at this time • Fruits well on softer maples • Distinctive fine ornamentation on cap rim
Warm Weather • These strains are bridge strains: some like a wide range, others more like cold weather strain. •General temperature range: 50-85°F •Mushroom quality is often better than wide range during warmest months •Spawn run time to first fruit 9-12 months. •These strains, as well as to a lesser extent the wide range are best choice when using soft hardwoods	Night Velvet		55-80°F	• Produces larger fruitings on older logs than wide range in the summer • Best strain for maples
	WW70		50-80°F	• Excellent fall fruiter with long fruiting season • Especially good for extended fall harvest in the south
	Bulochka		48-78°F	• Best at 50-77°F • Does well in high humidity/moisture areas • Good Indoor strain
Cold Weather •Growers in the south will utilize outdoor fruiting of these strains in the winter months •Northern growers should expect concentrated early spring and fall fruitings from these strains •The mushrooms produced are breathtaking in appearance and have outstanding flavor and texture. •Spawn run time to first fruit 9-12 months. •General tempertaure range 45-70°F •Do not respond well to force fruiting • Logs can be irrigated in the South in the winter months during appropriate fruiting times for that strain to initiate heavy fruiting.	Bellwether		48-64°F	• Earliest to fruit of all cold weathers • Expectionally beautiful bell shaped cap • Heaviest fruiting occurs in spring
	Miss Happiness		44-68°F	• Excellent fall fruiter • Long fruting season both spring and fall
	Snow Cap		44-68°F	• Likes high humidity for winter production in the south • One of the first cold weathers to be introduced • Can be force fruited with misting system
	Chocolov		40-62°F	• Earliest and latest fruiting of the season
	Jupiter		43-64°F	• Natural fruiting time; winter in the south, early spring and light fruiting in the fall, can be force fruited outdoors in the warmer winter areas with misiitng or soaking Dec thru March.



*Fruiting temperatures are a general range

Indicates the time when mushrooms are MOST LIKELY to fruit naturally

Indicates the best time to force fruit logs (Force fruit logs by soaking for 8-12 hours in cold water)

Go back to Strain Library

Cold weather

- Attributes of CW strains
  - Season Extenders
  - High Quality
  - Medicinal Qualities
  - Cannot be readily force fruited

Warm weather

- Attributes of WW strains

  High quality during summer heat

  Can be forced

Wide range

- WR strains

The workhorses of the log grown shiitake industry.

General Cultivation Overview:

Log Cultivation

Outdoor Production

Mushroom	Substrate	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Nov	Dec
Shiitake	Logs												
Oyster	Logs												
Nameko	Logs												
Maitake	Logs												
Olive Oys.	Logs												
Lion's Mane	Logs												
Comb Tooth	Logs												

Log Cultivation

- There are a variety of shiitake and oyster strains that vary in fruiting times

Outdoor Production

Mushroom	Substrate	Strain	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Shiitake	Logs	CW												
		WR												
		WW												
	Force Fruiting													
Oyster	Logs	CW												
		WR												
		WW												
Nameko	Logs													
Maitake	Logs													
Olive Oys.	Logs													
Lion's Mane	Logs													
Comb Tooth	Logs													

General Cultivation Overview: Log Cultivation

- Suitable tree species for log cultivation

TREE SPECIES

■ = Recommended ● = Satisfactory ▲ = Questionable

MUSHROOM VARIETIES	Alder	Apple	Ash	Aspen, Box Elder, Cottonwood & Willow	Basswood	Beech, American	Bitternut Hickory, Butternut, & Sulpher Bud	Black Birch & Paper Birch	Black Gum & Tupelo	Black Walnut	Blue Beech & Hornbeam	Buckeye	Buckthorn	Cherry	Chinese Tallow Tree & Tree of Heaven	Elm	Eucalyptus	Hackberry & Mulberry	Hophornbeam	Ironwood	Maple, Hard *(Sugar)*	Maple, Soft *(Red, Silver)*	Oak	Palms	Pear & Sycamore	Sassafras &Sourwood	Sweet Gum	Tulip & Yellow Poplar
Shiitake	■				●	■	●	●	●		■		▲	●			●		■	■	■	●	■			●	■	
Oyster	●		▲	■	●	●						●			●	●		■		●	●	●		●	●		●	■
Lion's Mane & Comb Tooth				●		■		●		●	■							■			■		▲				●	
Nameko	●	▲	●	■	●							■		■		●		●			■						■	
Olive Oysterling			●		●	■						●		●						●	■		■					
Maitake																							■					
Box Elder				■												●					●	●						
Reishi																					■	●	●				■	

Recommended are highly suitable, Satisfactory are moderately suitable, and Questionable can grow but yield low. Fields left blank are either unsuitable or untested.

Note: In Shiitake cultivation avoid Ash, Black Walnut, Elm, Black Locust. In Oyster cultivation avoid all Oak. For any of the above mushroom species avoid all Conifers.

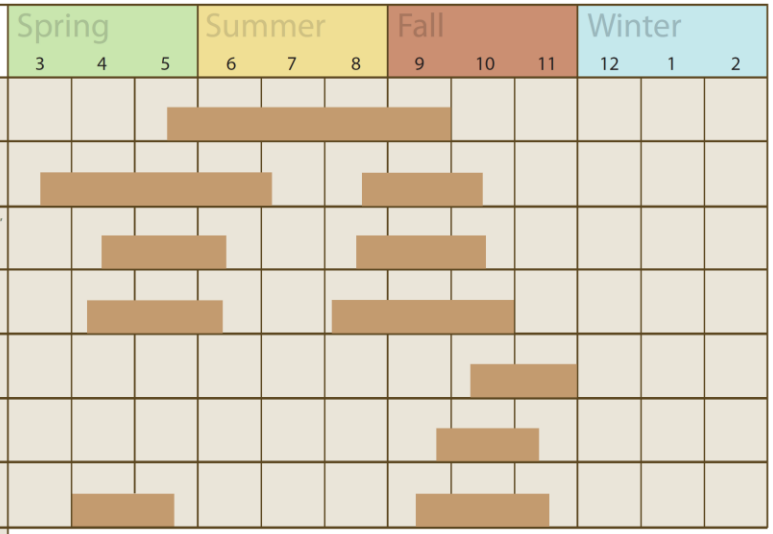
Oysters on Logs

Oyster Strain Chart

Resource Type	Strain Name	Image	Fruiting Temperatures*	Additional Details
Log and Substrate (such as straw) • Versatile, these strains work well in both substrates and in logs. • When oysters are grown on substrate they tend to be more predictable. Temperature and humidity are easily controlled indoors, therefore those seeking to grow oysters for weekly markets should grow oysters on substrate instead of on logs. • When growing outdoors on logs, fruiting depends completely on environmental conditions. We see higher overall mushroom production using the totem method for inoculation verses the drill and fill method.	Golden		60-85°F	• More vibrant when exposed to more intense lighting. • Slowest spawn run, be sure substrate is well treated, and use a high inoculation rate.
	Pohu		55-85°F	• Prolific strain that is a suitable choice for experimentation on various substrates. • Produces large parchment colored delicate clusters that are more sturdy in later flushes.
	Italian		50-70°F	• Delayed pinning indoors on substrates during hot months, may need to move into fruiting area once colonized. • Produces thick capped brown clusters with short tender white stems.
	Grey Dove		45-70°F	• Large vase shaped clusters with multiple mushrooms • Thick caps hold up well in storage and shipping • Prolific, fast spawn run. • Blue pins become grey with maturity, white stem.
Log Only • These strains fruit in low temperatures that are not usually present in indoor grow rooms, therefore they are considered to be log only strains. • Growing on substrates indoors would be completely experimental, no results guaranteed.	Blue Dolphin		32-45°F	• Requires near freezing temperatures to initiate fruiting. • Produces large hearty caps deep blue in color fading to dark grey.
	Polar White		45-55°F	• Has beautiful pure white hearty clusters. • Flavorful and crisp texture.
	Kira		40-60°F	• Has adapted to a wide range of woodtypes with multiple fruiting across the season. • Most fruiting occurs in the spring and fall.
Substrate Only • Pink is a great strain for substrates, but has been successfully cultivated on palm tree logs. • King can be grown on straw (results vary), but it does much better on a sterilized substrate.	Pink		65-85°F	• Spawn should not be refrigerated for more than five days as it is cold sensitive. • Fastest spawn run on substrates. • Mushrooms have short shelf life.
	King		55-65°F	• The entire mushroom is edible including the stem. • Prefers a cooler environment for fruiting, as listed to left.

*Fruiting temperatures are a general range

Seasonal Fruiting of Oyster Mushrooms on Logs



Indicates the time when mushrooms are MOST LIKELY to fruit naturally on logs

Oysters grown on substrates indoors can fruit all year round if the temperature and humidity are properly controlled. Strain adjustments may need to be made when control of these factors is limited.

Please Note: Oyster mushrooms usually do not respond to cold water soaking for force fruiting, such as Shiitake logs.

Nameko on Logs

Olive Oysterling

Lion's Mane & Comb Tooth

- Comb Tooth

Fall fruiting only

- Lion's Mane

Spring & fall fruiting

Maitake

- Fall fruiting

Maitake

- Inoculate sterilized oak in Feb.
- Incubate indoors in special bag
- Bury shallowly outdoors in May
- Harvest late August

General Cultivation Overview: Selecting a Mushroom

- Selecting a mushroom depends on:

Facility:

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Substrate:

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- Blocks
- Straw
- Compost
- Wood chips

Seasonality:

- Spring
- Summer
- Fall
- Winter

*****You can achieve 4 season mushroom production by utilizing various substrates and a combination of indoor/outdoor production of many mushrooms**

More Reasons to Grow Oyster Mushrooms?

- Easy to grow
- Aggressive in nature
- Available in many color and temperature ranges
- Marketable, a head turner at most farmers' markets

Oysters on Straw

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	Italian		50-70°F	• Delayed pinning indoors on substrates during hot months, may need to move into fruiting area once colonized. • Produces thick capped brown clusters with short tender white stems.
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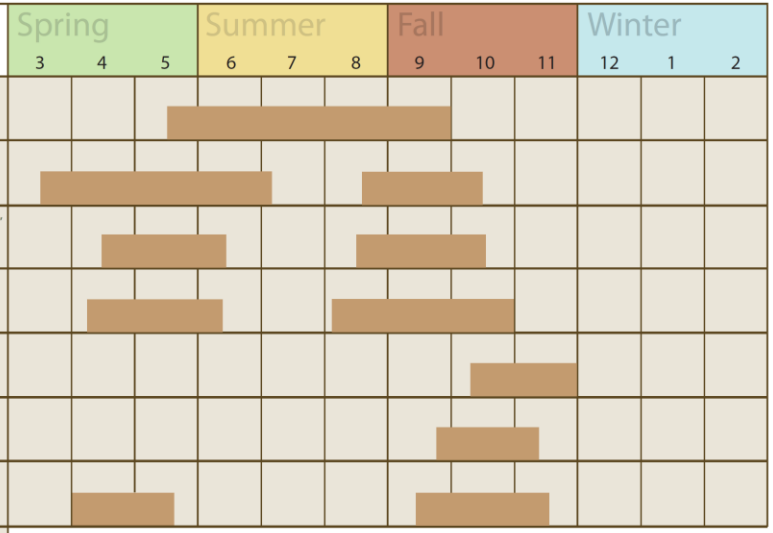

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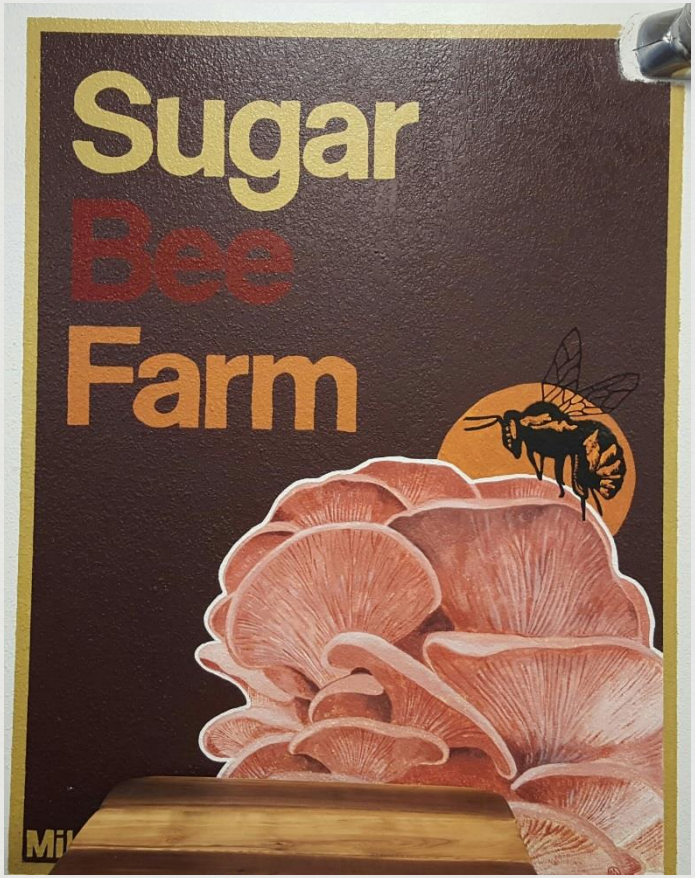
Sugar Bee Farm, Milwaukee, WI



- Oyster mushrooms on straw

Indoor Straw Production

Indoor Production

Mushroom	Substrate	Strain	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Oyster	Straw	CW												
		WR												
		WW												

Preparing the Straw

1) Chop Straw!
2) Store in a clean and dry area
3) Pack straw

Cold Pasteurization Method

- Use hydrated lime
- **No Magnesium!**
- 6-12g hydrated lime/gal water
  - pH 12
- Soak 24 hours
- Hang 24 hours to dry

Inoculating the Straw

Inoculation Rates

- Based on small bales
- Average weight 32 lbs
- Rehydrated weight 112 lbs
- One bale = 6 filled bags
- One bale requires 5 to 5.5 lbs of grain spawn
- One 4 lb grain spawn = 4/5 bale inoculated

Cold Pasteurization Method

- Inoculate
- Incubate 3 weeks @ 75°F
- Fruit @ 60-70°F

- Light is necessary!

Hot Pasteurization Method

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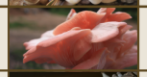
Substrate Only • Pink is a great strain for substrates, but has been successfully cultivated on palm tree logs. • King can be grown on straw (results vary), but it does much better on a sterilized substrate.	Pink		65-85°F	• Spawn should not be refrigerated for more than five days as it is cold sensitive. • Fastest spawn run on substrates. • Mushrooms have short shelf life.
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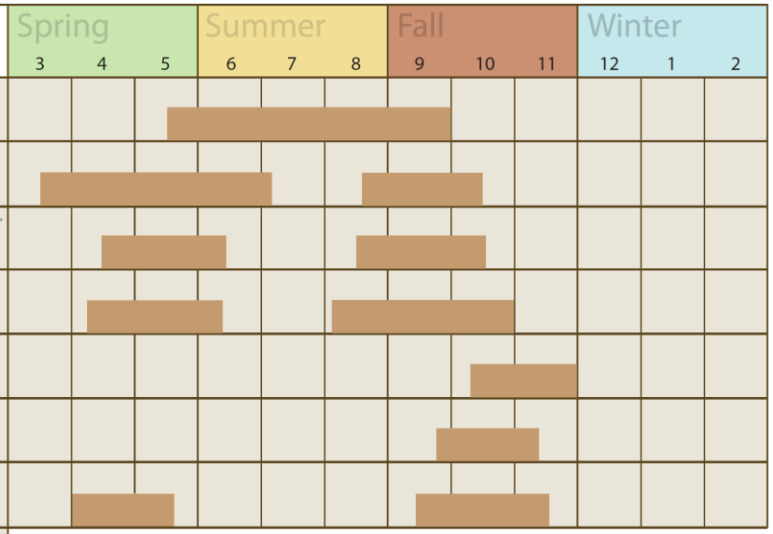

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Hot Pasteurization Method

- Fill permeable bags w/ chopped, clean straw
- Heat water to 160°F
- Soak straw for 40 minutes, 140-160°F
- Drain & cool 24 hours

Hot Pasteurization Method

- Inoculate @ 5% rate
- Punch holes with 4-6” centers around the bag
- 3-4 weeks later - Harvest!!

Incubation vs. Fruiting

Temperature between 75-77˚
Takes between 3-5 weeks

Temperature near 65˚ is ideal
Can fruit for 3 months or more

Results on Straw

Other Treatment Methods

Other treatments include:

Bleach
Soap
Peroxide
Fermentation

Contamination is more prevalent with all of these methods

General Cultivation Overview:
Selecting a Mushroom

- Selecting a mushroom depends on:

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General Cultivation Overview: Compost Beds

Indoor Production Outdoor Production

Mushroom	Substrate	Strain	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Almond Agaricus	Compost w/ cover													
	Compost w/o cover													
Blewit	Compost													

Compost Beds:
Almond Agaricus

Compost Beds:
Almond Agaricus

- Lots of smiles!

How do you choose?

Which mushroom should you grow?		
	Shiitake	Best Seller
	Oyster	Colorful and Easy
	Wine Cap	Colorful, Crisp and Easy
	Lion's Mane / Come Tooth	Reliable

How do you choose?

	Which other mushrooms should you consider?	
	Almond	Good yield, double crop, but best grown in polyhouse
	Nameko	Delicious, but unknown
	Olive Oysterling	Delicious, but unknown
	Maitake	Highly sought after, but requires sterilization or sawdust block cultivation

How do you choose?

	Which mushrooms require more work?	
	Shimeji	Delightful, but requires special treatment
	Blewit	Meaty, but still working on reliable

Thanks for not asking about morels!