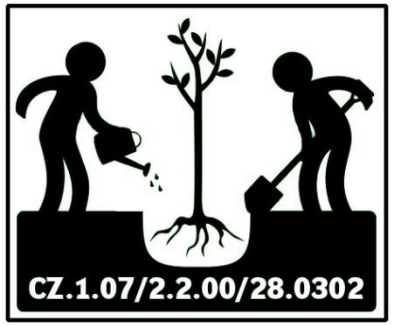
INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ



Inovace studijních programů AF a ZF MENDELU
směřující k vytvoření mezioborové integrace
CZ.1.07/2.2.00/28.0302

Tato prezentace je spolufinancovaná z Evropského sociálního fondu a státního rozpočtu České republiky

Growing of champignons

„White mushroom“

 Button mushroom (Agaricus bisporus)

Portobello (Agaricus hortensis)

 Pavement mushroom (Agaricus bitorquis)

- Common "trivial“ champignon for common kitchen consumption (sauces, wrapped fruiting bodies,...)
- No light for growth
- More susceptible to diseases
- Substrate is for commercial sale
- Characteristics depends on cultivated mushroom division

Crimini Agaricus brunnescens

- Gourmet delicacy (more aromatic), stronger, more durable
- Brown pigmentation requires light, grows well even in dark
- More resistant against bacteria and diseases
- Sold as granular seedlings by specialized sellers and producers
- Fruiting body expands into disc shape in full maturity phase

- trade name: supermarket mushroom or commercial mushroom

- Due to mistrust of growers, crimini is unjustly frowned upon, unpopular and not purchased
- More expensive - due to lower revenues and (un)popularity among growers and consumers

Almond mushroom (Blazei) Agaricus brasiliensis

- Specialized species of champignons – currently under specialized research
- High content of glucans
- Special adjustment for consumption, cannot be consumed raw
- Cannot be purchased commercially

Button mushroom Agaricus bisporus

- Grown in CR since 1945
- Revenues:

– CR 12 kg.m-2 (Agris Hodonín)
– Poland 17 kg.m-2
– Netherlands 24 kg.m-2
– Taiwan 38 kg.m-2 (top poducer)

Substrate

- Wheat straw and manure - ratio 9:1
  - Plenty of straw
  - Excrements are not used as source of nutrients but only as accessing to straw – disrupt pulp in the straw
  - Pulp is the material where mycelium grows
  - Fresh manure
    - » Horse manure (no more than 14 days old) – ideal
    - » Livestock manure
    - » Poultry manure
    - » Pig liquid manure
    - » Molasses

Pre-fermentation

- Common for both technologies
- Field threshing floor (a shed with a concrete floor and no walls), ammonia vapours do not accummulate
- Fermentation dump – mix of manure with straw – substrate –1.8 m high, 1.8 m wide
- Straw is sprayed with a hose to a max. water capacity until the water flows freely - then it's done

- Mechanic tossing: machine Engeler
  – Performance: 50m within 60min
- Tossing 3x after 2 days, previously manually 3x after 5-6 days
  - Distortion of straw pulp
  - Adjustment of ratio C:N
  - Loss of ammonia
- Substrate of chocolate brown colour after about 21-28 days, without ammonia, smells like fermenting wood, not a lot of water
  – When squeezed, no drops of water – clean hands

Technology

1. Three-zone (box) method – outdated method most commonly used in the CR
2. One-zone method (shelf)

Three-zone (box) method

Filling of boxes with substrate

- Boxes (wooden) have different sizes
  - Surface area: 1-1.2m2
  - Height: 12-20cm
- Transport into 1st zone (cubicle) - steaming

1. Steaming zone
High-lift truck – places boxes up to ceiling
a) Pasteurization
- Temperature 56-58°C for 6-24 hours
- Steam is blown into the room • must be tested, max. 2oC
- Target: – removal of unwanted microorganisms and plant seeds

– Development of thermophilic actinomycetes
(stimulates the growth of mycelium of mushrooms)

Conditioning

- Temperature 47-50°C, 3-5 days
- Target:

–Elimination of ammonia residues

–Support of growth of thermophilic bacteria

c) Cooling to 30°C

- Transport from chamber into the handling area

d) Seed the substrate with seedlings

1. Dehydrated seedlings (in packets)

– Less active, worse, substantially longer seeding process

2. Granular seedling

– Overcooked wheat caryopses (inactive) seeded with appropriate strain of champignons

- Consumption of seeds:

1.0L(kg).m-2 of growing area – Those who do not have seedling manufacture use 1L, those who have seedling manufacture give rather 2L seedlings per 1m2 – accelerates the whole cycle

- Seeding 2-3cm deep (into triangle) into boxes with substrate (top is covered with paper – maintains moisture)

- Quality seedling - white because of mycelium, without liquid
- No water in glass

– Yellow-orange liquid will destroy the substrate

- Best seedlings – whole profile covered with white “cotton wool”
- 1L of seedling: 40- 50 CZK/glass
- Do not buy seedling in stores - always buy seedlings from producers

2. Incubation zone

e) Growth, colonization of the substrate by mycelium

- Temperature 29°C at the beginning, decrease to 22°C
- Moisture 65%
- Period of growing: 8-21 days

□□ Whitish mycelium must grow all the way to the bottom of the box

- In whole profile of substrate

- Transport into the handling area

f) Covering with soil

- 3-4cm layer – soil from greater depths (1m) (so that seeds are not germinating)

+ Alkalised steamed peaty substrate, pH 7.5–7.8

(if the pH was acidic, fruiting bodies will be rusty)

- Purpose:

– Maintaining of moisture

– Mycelium must come across an obstacle (covering soil) to form fruiting body - formation of fruiting bodies

- Transport into harvest zone using high-lift truck

3. Harvest zone

• Temperature: 20°C (22-20°C) at the beginning

□□After germs of fruiting bodies appear (primordia) – white spots about the size of a pinhead:

(In 4 days the fruiting bodies of champignons are ready for harvest)

□ Temperature: 15-16°C

□ Air moisture: 90%

□ Content of CO2: 0.05-0.1%

(above 0.2%: long thin stipe of fruiting body)

□□Daily harvest in rounds: 1st round is the biggest harvest, then amount of harvest slightly decreases, highest harvests: after 7 days 7 days

7 days

Intensive growing: period of harvest equals 28-42 days, then it is not economic, throw away

– Substrate after fruiting is finished – ideal as a fertilizer for vegetables,

=> Decomposed fermented manure

– GDR and CR grew champignons in greenhouses over winter and used the substrate for cucumbers in summer

Storing of champignons

- Champignons last in refrigerator on open small trays for 7-10 days at 8-10°C
- Bowls, small trays from polystyrene, below foil
- No mould is allowed!

One-zone system - shelves

- One room - one growing cubicle – everything is prepared there
  - There are shelves on side, with aisle in the middle
  - Shelf is 80-90cm wide, 4-5 levels above each other
  - Shelves area filled with substrate using a conveyor belt in the aisle
- All cubicles: heating up to 60°C
  - Cubicles are filled within 1 day: must be immediately heated to 60°C, otherwise mould is produced

- Increase to 60°C: pasteurization at 56-58°C
- Conditioning at 47-50°C
- Seeding of substrate on shelves
- Incubation
- Covering with soil
- Harvest
- Conveyor belt – transport of substrate after fruiting is finished (fertilizer)

Advantages of one-zone system - shelves

- Less labour-intensive
- Movable shelves with mesh bottom

– polyethylene on conveyors

OYSTER

- On the market, there are seedlings of oysters:
  - Oyster mushroom
    Pleurotus ostreatus
  - Branched oyster mushroom
    Pleurotus cornucopiae
  - Phoenix mushroom
    Pleurotus pulmonarius
  - King oyster mushroom
    Pleurotus Eryngii

OYSTER MUSHROOM – Pleurotus ostreatus

- Wood-decay fungus - rotting stumps
- Colour: brown, grey, purple
- Bundles weighing several kg (0.5–7kg)

Substrate

– Crushed straw: wheat, rye or rape (barley and oat are less appropriate – poorly accept water)

– Crushed corn cobs

– Shavings from deciduous trees (oak, beech)

• Length of culm: 1.5-2cm for good soaking of water • without manure (!)

- Consumption: 2-5 kg of seedlings per 100kg of straw
- Filled into special metal containers filled with foil – width of container: max. 30 cm, height: 1.8-2 m

Technological procedure

- Wetting of straw to 70-75% moisture
- Transport into steaming chamber with grate at the bottom
- Pumping of 70°C air from underneath the grate for 12 hours
- Cooling to 25°C
- Filling of substrate into containers + admixture of seedlings
- Growth of mycelia at 24-27°C – 14 days
- Formation of fruiting bodies: within 7-10 days after mycelia appear
- Temperature from 8°C to max. 20°C
- Productive only at light: 8-10lux is enough 12 hours a day
- Harvest: in 12 days after first fruiting bodies appeared

- Harvest rounds (after 10-14 days)
- Harvest: 10-20 kg of oysters per 100kg substrate
- Total length of growing: 10-16 weeks
- Fruiting bodies are open at the bottom –spores irritate airways
- Consummation: within 72 hours after harvest (in refrigerator) – mould on damaged areas

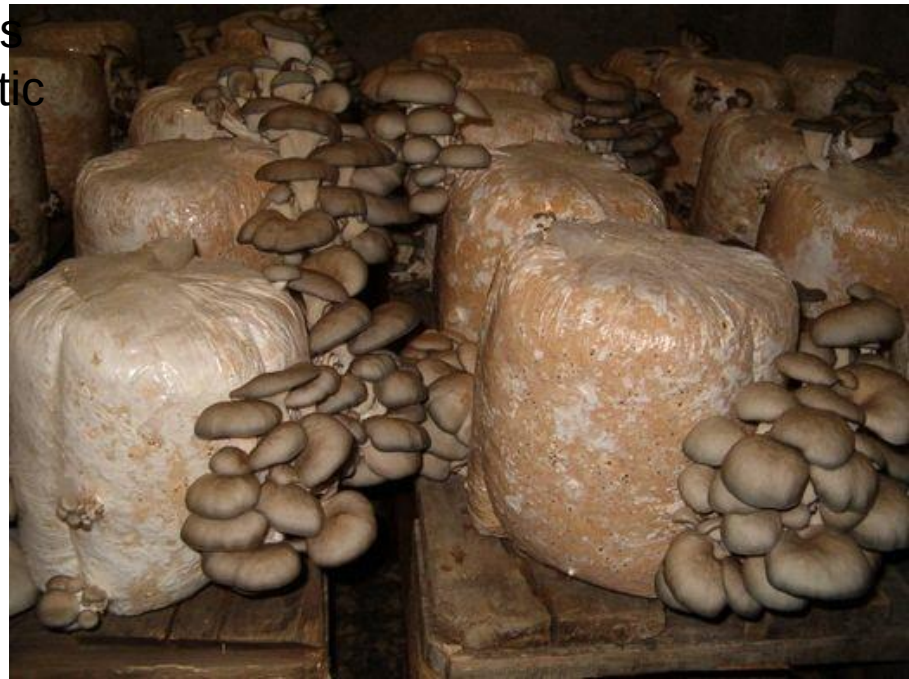
- Each plant must have some processing capacities, if mushrooms are not sold: – drying (Vitana Býšice – mushroom soup)
– Pickled with vinegar
- Substrate after fruiting is finished - feed for livestock

10-15% content in feed: calming effect, causes drowsiness and weight gain (like beer)

- Oyster is aromatic fungus

- Flavour is stronger, more aromatic

- Cannot be stored (!)



5th day 1st round

8th day of 1st round

2nd round

End of 2nd round