لیکونکی
محمدرضا شاهدی، ریسرج آفسر
پلانت پیتیالوچی میکسیشن
نظرنامه
داکtor مهدی داکtor دامیکر
زیست‌شناسی افرات، میکرو (شمال) سروات
سال: 2014
الوصف نما (آنسير) خريرى و كروا سبالخت

تعريف:
مشروع با خريرى و كروا فالتى مكى دى. جى ينين دى دى دى دى دى دى دى. دى دى دى دى دى دى دى
دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى دى.

آنسير خريرى و كروا اهمى:
- دى ١٠٠ كرام آنسير خريرى و كروا.

<table>
<thead>
<tr>
<th>الاسم</th>
<th>نماد (١٠٠)</th>
</tr>
</thead>
<tbody>
<tr>
<td>لحمات</td>
<td>٢٧.٥</td>
</tr>
<tr>
<td>روحانى</td>
<td>٢.٢</td>
</tr>
<tr>
<td>شكرا</td>
<td>٠.٢</td>
</tr>
<tr>
<td>نشامه</td>
<td>٠.١</td>
</tr>
<tr>
<td>حيانى ج</td>
<td>٠.٠٦</td>
</tr>
<tr>
<td>فاسفورس</td>
<td>١.٦</td>
</tr>
<tr>
<td>بيتايم</td>
<td>٢.٥</td>
</tr>
</tbody>
</table>

شأى:
تجزئی اهمیت:

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)

ذخیره و گذاری مواد وابسته به دست‌رسی و وابستگی به دست‌رسی سطح افراکسیون می‌باشد. (Spent)
جودة المواد في جرائيم نهائي كول دي:

- (Composting)
  
  زمودي وسمح بالمواد في جرائيم نهائي كول دي. 

- طريقة توربينية في:
  
  يه بروه با يه بيوس بانه دار ذ باره ذ كمبوست ليازلي.

- جودة المواد في جرائيم نهائي كول دي: 
  
  يه بروه با يه بيوس بانه دار ذ باره ذ كمبوست ليازلي:

- جودة المواد في جرائيم نهائي كول دي:
  
  -(Pasteurization)

- مواد جرائيم نهائي كول دي:
  
  دكموستنكن نه دت مواد جرائيم نه با كول يكار دي. مواد يه بلاستيك تيلو كني

- مواد جرائيم نهائي كول دي:
  
  - (Steam)
لا يوجد نص يمكن قراءته بشكل طبيعي من الصورة المقدمة.
خوراکی پھ اخبار کہنی پہنچ رہی ہے 250 ملی گرمی سنیتی گریپ ہیں جنہیں اورچ کری کو 200 گرم بلاستیک میں بند کیا ہے کئی نہیں۔ 

خوراکی پھ اخبار کہنی پہنچ رہی ہے 250 ملی گرمی سنیتی گریپ ہیں جنہیں اورچ کری کو 200 گرم بلاستیک میں بند کیا ہے کئی نہیں۔ 

خوراکی پھ اخبار کہنی پہنچ رہی ہے 250 ملی گرمی سنیتی گریپ ہیں جنہیں اورچ کری کو 200 گرم بلاستیک میں بند کیا ہے کئی نہیں۔
Financed By: IAO
Under the Project
“Agriculture Development Project in Swat
Gender, Cooperatives & Hill Orchards”
(ADP-SWAT-2/ARI GECOHO)

0946-815783  0946-812284
shahid_aupp@yahoo.com

Edited By: Naveed Khan
Translation of the above brochure in English Language

Cultivation and management of oyster mushrooms in upper Swat.

Introduction:
Mushrooms are among the most nutritious foods and considered much important all over the world due to its protein content. Mushrooms are cultivated in more than 80 countries worldwide. Many commercial producer countries export their produce to other parts of the world. Luckily, the environmental conditions of our country for the cultivation of mushrooms are very much conducive in general but particularly of District Swat. The inputs and initial cost for the cultivation of mushrooms as a crop are much lesser as compared to other agronomic crops. Mainly the agricultural wastes left from other agronomic crops are used for the cultivation of oyster mushrooms e.g. wheat straw, rice straw, corn cobs, cotton waste, saw dust, leaves of specific trees and old newspaper etc.

Importance of mushrooms as food:
Oyster mushrooms are also called as Meat of the Wood/ Jungle. In dry mushrooms, up to 47% of proteins have been reported while chicken and goat has 20% protein content. Mushrooms have very low content of carbohydrates (sugar) therefore its safe for diabetic patients. Mushrooms have also been reported to reduce the blood cholesterol level. Apart from this, mushrooms have medicinal properties and can be helpful for persons with partial paralysis, diabetes, heart problems and cancer.

Edible Contents of oyster mushrooms:
In 100 g of fresh oyster mushrooms;

1. Proteins 27.9%
2. Fats 2.2%
3. Sugar (carbohydrates) 0.2%
4. Starch 0.1%
5. Vitamins 0.06%
6. Phosphorus 1.6%
7. Potassium 2.5%
8. Calcium 0.04%
9. Copper 0.02%
10. Iron 0.01%
Commercial importance of oyster mushrooms:
Cultivation and production of oyster mushrooms is a very profitable business. The initial cost is very low compared to other crops. Mushroom cultivation can be adapted by unemployed persons as well as by women and elder persons as a small profitable cottage industry. In our country, most of the mushrooms needed in five star hotels and pizzas are imported from other countries. Therefore, there is a very potential market for producers here. The left over material from the cultivation of mushrooms at the end of the season is known as “mushrooms’ spent”. This spent can be used as organic fertilizer for agronomic crops.

Seeds of oyster mushrooms (Spawn):
The seeds of mushrooms for cultivation are not like other seeds of agronomic crops. Rather, it’s fungal mycelia grown on a medium like grains of wheat, sorghum or barley etc. The seed of mushrooms used for cultivation is known as Spawn. The spawn is prepared by experts in labs in a controlled environment. The spawn is available with the agricultural research institutes or agricultural universities but not in open market here.

Cultivation season:
In plain areas mushrooms can be cultivated from October to April while in upper hilly areas from April to August. But mushrooms can be cultivated throughout the year by maintaining proper levels of moisture, humidity and temperature.

Environmental conditions required:
For the cultivation of oyster mushrooms, the optimum temperature is 20°C to 28°C, moisture in substrate is 60% while relative humidity of 70% to 90%.

Material needed for cultivation (locally evaluated method):
The material needed for cultivation include, wheat straw (rice straw, cotton waste, saw dust can also be used), spawn, polypropylene bags, rubber bands, steel drum with lid, internal and external drum stands and racks.

Preparation of substrate for cultivation:
The substrate or compost is prepared in two steps for oyster mushrooms. In step 1, the substrate (wheat straw) is soaked in water for an hour. Then excess moisture is drained and final moisture adjusted around 60%. In step 2, the moistened substrate is pasteurized by steam.

Pasteurization of substrate:
The moistened substrate is filled in crystalline polypropylene bags, tighten the open end of straw filled bag with rubber band and put them inside a steel drum on internal drum stand. Put some water in the drum to generate steam. Put the lid of the drum to trap steam inside. Make a fire under the steel drum and steam the substrate filled bags for about an hour in order to completely pasteurize the substrate inside the bags. After an hour of pasteurization, take the hot substrate filled bags out of the steel drum and put on racks in a growth room (a separate room for cultivation of mushrooms) until they cool down to room temperature.

**Inoculation of substrate (spawning):**
When the substrate is pasteurized and the temperature of the substrate is dropped to room temperature, then the spawn of oyster mushrooms is added. For this purpose, slightly open the open end of the substrate filled bags by removing the rubber band and spread about one tablespoon full of mushroom spawn. Then put the rubber band in place again. It should be remembered that before spawning, one must sterilize his hands with methylated spirit (methyl alcohol) or wash hands with soap in order to avoid any contamination from hands. After spawning, put the spawned straw filled bags on racks in a dark room or spawn running room.

**Spawn running:**
After the inoculation of substrate with spawn, put the bags on shelves or racks above ground level in a dark room. Mushrooms do not need light at all. The spawn running should be carried out in a dark room with proper ventilation but must be free of dust and other contaminants. The optimum temperature should be between 20°C and 25°C for spawn running. The spawn run gets completed in about 35 to 40 days if the optimum temperature is kept constant. Completion of spawn run is indicated by a thick white mycelial growth all around the substrate in bags. There should be no mycelial growth of other colors than white. As oyster mushrooms have white color mycelia only.

**Removal of bags from substrate and watering:**
Until the spawn run is completed there is no need of watering the substrate as the initial 60% moisture level in substrate is enough for mycelial growth. Once the spawn run is complete, carefully remove the crystalline polypropylene bag from the straw (substrate) having a good white growth of mycelia on substrate. Now we have “cakes” of wheat straw and fungal mycelia. Sprinkle these cakes twice a day with clean water in order to keep the surface of cake moistened. Do not let them dry. In a few days, one can notice small outgrowths all around the surface of the
cake. These small outgrowths are called as the “pin-heads”. These are small tiny mushrooms which will be fully oyster shaped mushrooms in about 4 to five days and will be ready to pick.

**Picking/ harvesting mushrooms:**
The fully grown mushrooms can be picked by holding the mushroom or bunch of mushrooms at the very bottom near the substrate with the thumb and finger. Carefully uproot the mushrooms along with little aggregated mycelia and substrate. Knife cut the base having aggregated mycelia and substrate. Clean the mushrooms and they are ready for packing or cooking. A cake of mushrooms can give up to 3 flushes in one growing season at different intervals. So do not discard the cakes after first or second flush/ pick. Keep them until a tough mycelial mate is formed all around the cake or until they do not produce any more pin heads.

Fresh oyster mushrooms have up to 90% moisture content therefore, they get dehydrated and then rotten very soon. So, fresh mushrooms must be refrigerated or frozen until use. These mushrooms can be sun dried as well and can be stored for longer periods then.

For further information in this regard, please contact Plant Pathology Section, Agricultural Research Institute Mingora Swat.

This is the translation of the brochure published and distributed among the beneficiaries of the project. The brochure has been written in Pashto language (local language).

This brochure has been written by Muhammad Shahid, Research Officer and reviewed by Dr. Abdul Bari, Director ARI, Mingora Swat. The brochure has logos of IAO and ARI, Mingora on front page. The sponsoring agency has been mentioned on the back page of the brochure as well. Samples of the brochure have already been provided to IAO, Islamabad.