

Cultivation of *Agricus biporus* by using Domestic System

Thesis submitted for the partial fulfillment of the degree of

MASTER OF SCIENCE

IN

BIOTEHNOLOGY

Submitted by

Akshay Dhadwal

197822



Department of Bioinformatics and Biotechnology

Jaypee University of Information Technology

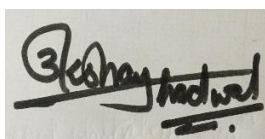
Wakhnaghat,

Solan, H.P

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DECLARATION

I hereby declare that the first phase of my M.Sc. Minor Project Thesis entitles “**Cultivation of *Agaricus bisporus* by using Domestic System**” from period of August(2020) to February(2021) under the guidance and supervision of Dr. Hemant Sood (Associate Professor) and the second phase of my M.Sc. Major Project Report Entitle “**Industrial Training At Minchy’s Food Products**” from period of February(2021) to April(2021) submitted in partial fulfillment for the award of degree of Master of Science in Biotechnology to Jaypee University of Information Technology, Wakhnaghat, Solan (H.P) is original work carried out by me under the guidance and supervision of Dr. Hemant Sood (Associate Professor). No part of this report has been submitted for any other degree or diploma to this or any other university.

A handwritten signature in black ink on a light-colored background. The signature is written in a cursive style and appears to read 'Akshay Dhadwal'.

Akshay Dhadwal

Place: Wakhnaghat

Date : 15-05-21

CERTIFICATE – I

This is to certify that the thesis entitles “**Cultivation of *Agaricus bisporus* by using Domestic System**” submitted in partial fulfillment for the award of degree of Master of Science in Biotechnology to Jaypee University of Information Technology ,Wakhnaghat, Solan (H.P) is original research work carried out by Akshay Dhadwal (197822) under my guidance and supervision. No part of this thesis has been submitted for any other degree or diploma to this or any other university.

The assistance and help received during the course of investigation has been duly acknowledged.

Name: Dr. Hemant Sood (Associate Professor)



Signature

Place: Wakhnaghat

Date :13-07 -21

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*I express my gratitude to all those who helped me to prepare and complete my thesis entitled “Cultivation of Agaricus bisporus by using Domestic System”. I would seize the opportunity to acknowledge my deep sense of gratitude towards all those who extended their kind help in fulfilling this endeavor. I avail this opportunity to acknowledge my sincere and humble indebtedness and wholehearted sense of gratitude to my guide **Dr. Hemant Sood** (Assistant Professor), from Department of Bioinformatics and Biotechnology, Jaypee University, she conceived and shaped the research problem and provided adept guidance. Her deep inside into science and constant generation of new ideas helped me tremendously in my work. It was her valuable discussions and endeavor through which I have gained a lot. Her constant encouragement and confidence imbining attitude has always been a moral support for me. I was indeed fortunate to have been associated with her. I am also thankful to Dr. Udaybanu M (Associate Professor), HOD Prof. Sudhir Syal for their motivation*

I would like to thank my family, my sister and friend (Sunidhi Dhadwal) for her endeavoring support, consistent help and encouragement during all times whenever it was needed.

However, above all I thank “GOD” for his grace and kindly light that has always shown on me as I moved through this venture. I owe a life-long indebtedness to him.

Akshay Dhadwal

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Abstract

A mushroom is the plump, spore-bearing organ of a fungus belonging to the family Agaricaceae that usually cultivate above the ground on its food source. The word mushroom is most often called to those fungi which possess a stem, a cap and gills on the underside of the cap. Their spores are referred to as basidiospores, It is also helpful to cure many of the diseases, since it possesses antibacterial, antifungal, antioxidant, anti-inflammatory and anticancer activities. The study has been used for the cultivation of mushroom from household waste materials such as dead and decay fruits and vegetables. By using domestic system two harvests of mushroom crops was generate. Spawn of 250 gm was used as inoculums in 5kg of compost bag which contained decomposed kitchen waste produced 300 to450 gm of compost bag. So this system could be used for carrying out cost effective and environment friendly production of mushroom by optimizing household conditions

Chapter 1

Introduction

1(a) *Agricus biporus*

Agricus biporus is a type of fungi which commercially grown on a large scale usually cultivated above the ground on compost [1]. The word mushroom is most often called to those fungi which possess a stem, a cap and gills on the underside of the cap. Their spores are referred to as basidiospores. Mushrooms lack chlorophyll and live on dead and decay organic matter and called as saprophytic. Basically mushroom has these parts

- i) Pileus - the cap like structure &
- ii) Mycelia – the thread like structure.

Mushrooms have gained recognition in the food chain because of their medicinal and pharmaceutical value. Hilly regions are appropriate for button mushrooms as they require low temperature for cultivation. The cultivation of mushrooms is done from mid November to mid March [2]. The conditions required for mushroom cultivation are as follows:

- A temperature range of 22-25°C for spawn run
- A temperature range of 14-18°C for mushroom production
- 85-90% humidity level
- The area that is used for mushroom cultivation should have proper ventilation [3]

Scientific classification:

Kingdom:	Fungi
Class:	Agaricomycetes
Family:	Agaricaceae
Genus:	<i>Agricus</i>
Species:	<i>A. bisporus</i>



Fig: 1(a) *Agricus Bisporus*

1(b) Common name & Synonyms:

- *Agricus bisporus* is harvested in many countries and most widely consumed mushroom across globe.
- This mushroom is known as Swiss brown mushroom, Roman mushroom, Italian mushroom, Cremini mushroom, Chestnut mushroom when is in immature state
- Also, when the mushroom is completely mature, it is known as White Button Mushroom, Common Mushroom and Table Mushroom.

Chapter 1.1
Review of Literature

A mushroom is a plump, spore-bearing organ of a fungus belonging to the family Agaricaceae that usually cultivate above the ground on its food source [4]. The word mushroom is most often called to those fungi which possess a stem, a cap and gills on the underside of the cap. Their spores are referred to as basidiospores. Mushrooms lack chlorophyll and live on dead and decay organic matter and are called as saprophytic. *Agaricus bisporus* is cultivated in many countries and is most widely consumed mushroom across the globe. [5] This mushroom is known as Swiss brown mushroom, Roman mushroom, Italian mushroom, Cremini mushroom, Chestnut mushroom when it is in an immature state. Also, when the mushroom is completely mature, it is known as White Button Mushroom, Common Mushroom and Table Mushroom. [6]

The mushroom comprises two parts, an underground part which is known as mycelium and an above-ground part which is usually the edible part called as the reproductive organ.

Spores – These are microscopic seeds which serve as reproductive organs in the mushroom.

Stem – A part of the mushroom that supports the mushroom's cap. [7]

Gill- A fertile seed-bearing part of the button mushroom which is located under the cap.

Mycelium- It is called as hyphae which is formed through spore germination, from which the edible part of the mushroom grows.

Hypha – Is a microscopic filament that secretes water and the nutrients necessary for mushroom growth.

Cap – It protects the gills of the mushroom. [8]



Fig: 1.1 Parts of Mushroom

1.1(a) Taxonomy

Mushroom has confined intricate classification history. The first mushroom was characterized by Mordecai Cubitt Cooke (Botanist) in his book entitled British Fungi in the year 1871. Later, Danish Plant Scientist named Jakob Emanuel Laue appraised the mushroom in 1926 [9]

1.1(b) Medicinal Properties

Button mushroom is a fungus that produces spores just like pollen or seeds [10]. There are wide ranges of mushroom which are consumable and well known species such as button mushroom, oyster mushroom, porcini etc. There are, however, several species that don't seem to be consumable and might indeed cause abdomen pain or vomiting if devoured, and in some cases may be fatal such as death cap mushroom [11]

A wide range of palatable mushroom contains fluctuating levels of proteins and fibers. They contain Vitamin B as well as an incredible cell reinforcement called selenium, which assist immune system and prevents cells and tissue. Button mushroom when grown whether indoor or outdoor, they are exposed to ultraviolet radiation light that will increase their concentration of Vitamin D [12]

1.1(c) Cancer -Fighting Properties

Various cell reinforcement compounds together with polyphenols, polysaccharides, ergothioneine, glutathione, selenium and ascorbic acid are accepted to be behind mushroom potential cancer-fighting properties.

This cell reinforcement protects us from harmful effect of oxidative stress, which prompts cell harm which will accelerate maturing and increment the risk of developing cardiovascular disease and bond cancer. The principle phenolic compound in button mushroom are flavonoids and phenoloplast acid which can possibly act both as cancer preventing agents and favorable to oxidants.

One specific variety of polysaccharide is beta glucan that stimulates immune system to activate macrophages and characteristic executioner cells that protects the body from infection, harmful organism and cancer.

Glutathione act both as a cell reinforcement and detoxification specialist, implying that it kills conceivably unsafe substances that are unfamiliar to the body. Ergothioneine shields DNA from aerobic injury

The present study carried out with following objectives:

1. To develop compost or manure by using domestic/kitchen waste for growing mushroom
2. To optimize house hold conditions for growing mushroom

Chapter 1.2

Materials and Methodology

1.2(a) Mushroom Compost

Compost generally refers to a mixture that comprises generally decayed naturally occurring matter which is utilized for fertilizing or to provide nutrient. Basically it is used as a substrate for growing button mushroom .the most important step for the preparation of compost is decomposition of organic material by microbes for better absorption of moisture retention. Generally there are two methods of compost preparation long term and short term method [13].

Following were the steps involved in the formation of compost [Fig. 1.2(a)]

- Wet the straw completely by putting it in hot boiling water (overnight)
- A dry matter like saw dust, soil, compost from home grown waste are mixed with wet straw and make a pile
- After mixing all the materials the pile should be turned with an interval of 7 Days to Facilitates quicker decay and maximum heating to such an extent that there is no invasion of pest or pathogen
- Every flip ought to be in the course of sprinkling water
- The ready to use compost ought to be brown in color

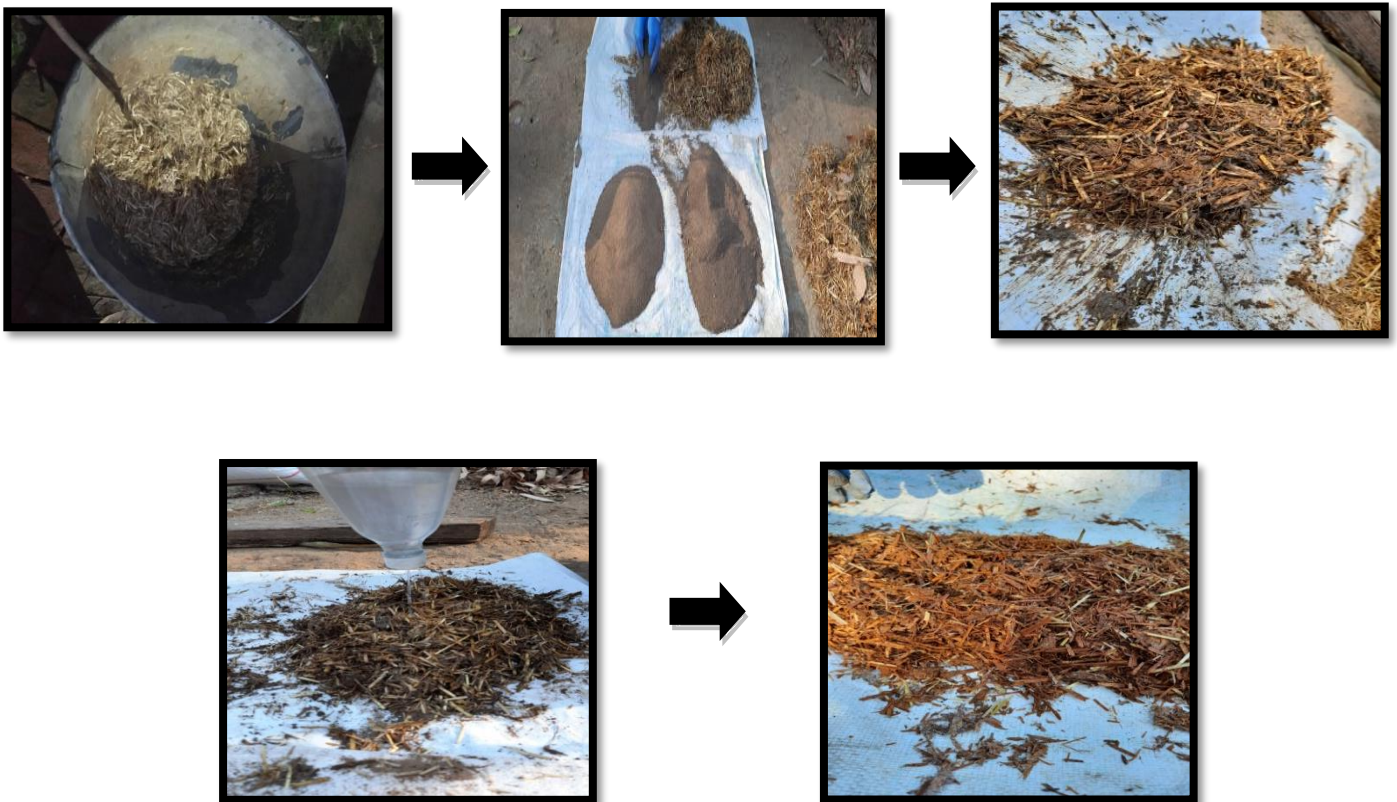


Fig. 1.2(a) Steps involved in formation of compost

1.2(b) Manure

Manure or fertilizer is the disintegrated type of dead plants materials, home grown waste, and cow dung that is applied to the soil to increase the production. It is natural type of plant food and is cost – efficient. The animal waste material is additionally utilized as manure. [14]

Manure is profoundly wealthy in natural matter and humus and therefore improves the soil fertility. Manure is higher within the long term use and doesn't cause any pollution. It is an important and sustainable asset



Fig. 1.2(b) Preparation of Manure

1.2(c) Spawn Run

The spawn used in this study was ordered from Ravi Agro Mushroom Farm situated at Jawali Town (H.P.) and they delivered the spawn in 4to5 days with some guidelines

For the cultivation of mushroom spawn is prepared from sterilized wheat grains [Fig.8]. The nature of mushroom enormously relies upon the virtue of the spawn used. Spawn Bags [Fig.9] are prepared for the production of mushroom cultivation in which a layer of spawn is prepared [Fig.10 & Fig.11]. Water is besprent to keep up the humidity around 90 to 95%. Temperature is additionally maintained around 20 to 25⁰C. After spawn run the mycelia growth is begin showing up within 15 to 20 days of spawn layer [15]

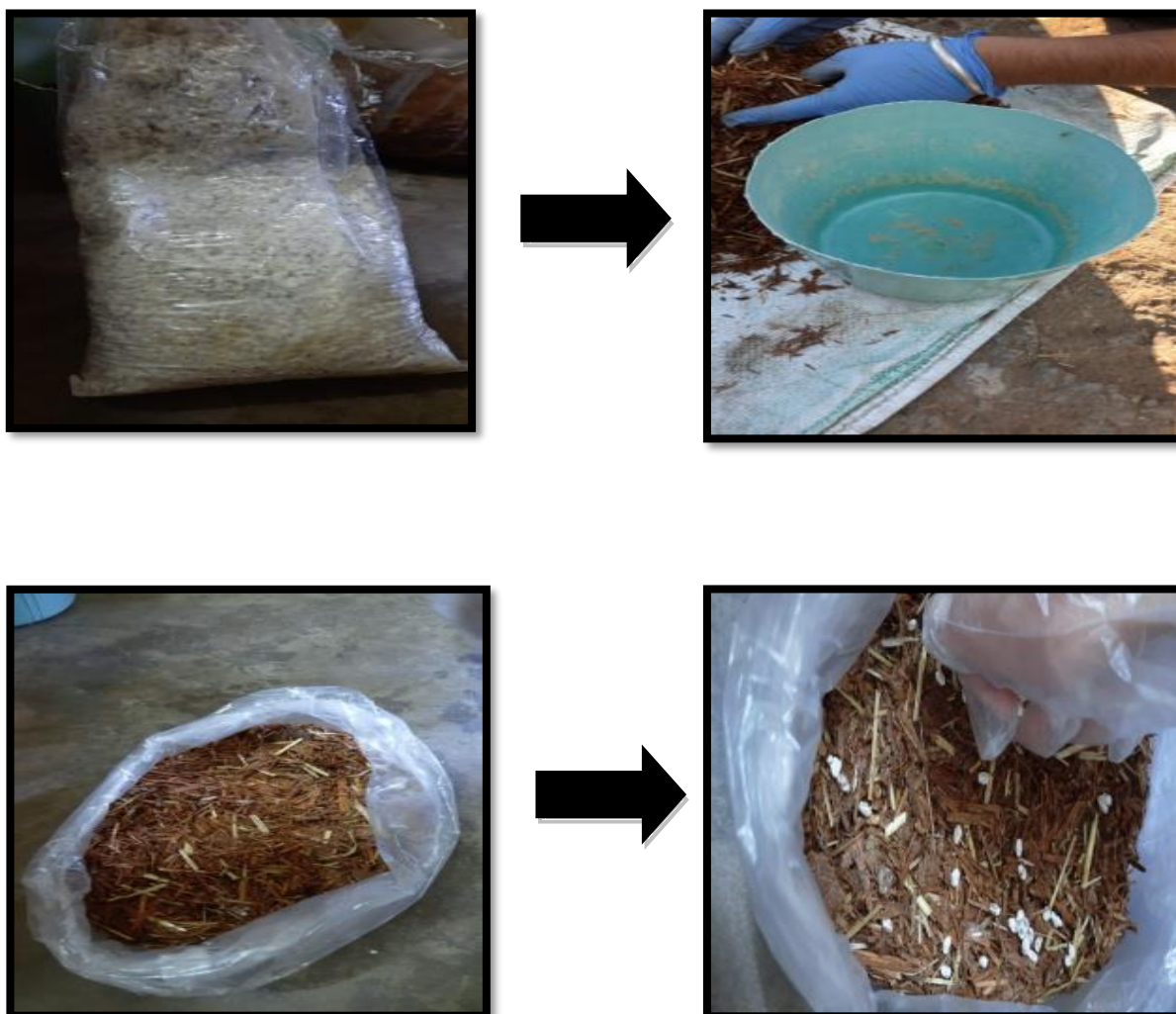


Fig. 1.2(c) Spawn Run

1.2(d) Casing Soil

Casing soil may be defined as a protecting layer with a particular microclimate that helps in the development of organic fruit bodies. Compost varies from manure or compost in its nutrient properties as casing soil will hold great quantity of water and provides it up once necessary. [16]

Sterilizing the casing soil is important to prevent the growth of microorganism in the soil. Heat and soil solarization method can be used to sterilize the soil by controlling the growth of parasitic moulds



Fig.1.2 (d) Casing soil

1.2(e) Harvesting

The cutting of crop plants once mature is termed as harvesting. Harvesting is done when mushroom is fully grown at button stage. The first yield seems around 3 weeks subsequent to casing. [17]

Mushroom has to be harvested by twisting clockwise and anticlockwise direction without disturbing the casing soil. When the harvesting is finished, the gaps in the bags ought to be filled with solarized casing soil and then sprinkle some water. [18]



Fig 1.2(e) Harvesting of mushroom

Chapter 1.3

Results and Discussion

The first yield of mushroom will be collected to 10 to 12 days subsequent to spawning [19]. The first growth typically provides 150 to 200 grams yield of the expected yield is obtained. The second yield of mushroom additionally takes few days to harvest (2 to 3 Days), yet the yield will be significantly less around 100 grams. The total yield harvested with 250 grams of spawn is around 300 to 450 grams in two rotation period of harvesting It ought to be noticed that bag or box cultivated mushrooms are less grow in clusters than spawns planted in beds. The details of growth mentioned in table 1.

Due to semi-controlled conditions within the growing area, pest and diseases are more effortlessly controlled. The bags which shows contamination can be removed just after the incubation period to forestall spreading of contamination within the growing region

Table 1: Growth observed in different time intervals

S.NO.	DAY	OBSERVATION
1	One	No mycelium growth [Fig.1.3(a)]
2	Three	no growth [Fig.1.3(a)]
3	Five	Little growth is shown over the surface of casing soil [Fig.1.3(b)]
4	Seven	White little snow like crystals are visible [Fig.1.3(c)]
5	Nine	Small mushroom clearly Visible [Fig.1.3(d)]
6	Eleven	Fully matured mushroom is ready to harvest [Fig.1.3(e)]



Fig.13 (a) No mycelium Growth is visible



Fig.1.3 (b) Mycelium growth is Visible



Fig.1.3(c) White Snow like Crystal



Fig.1.3 (d)Small mushroom is clearly visible



Fig.1.3 (e) fully matured Mushrooms

Conclusion

The present study carried out by using house hold waste to develop compost or manure with mixtures conventionally used for growing mushroom. It helps in developing cost effective methodology for the growth of *Agricus bisporus* and can be tested for other commercial important mushroom like Oyster, Shiitake etc. Commercially 4-5 days harvested were generated by producers but in this system two good harvests were generated out of four harvests' in total

Chapter 1.4

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Chapter 2

Industrial Training



Minocha Industries

Minchys[®]

Training Certificate

This is to certify that Mr. Akshay Dhadwal S/o Mr. Sudarshan Kumar Dhadwal student of Biotechnology has undertaken industrial Training for 75 days from 17/02/2021 To 30/04/2021 Including Sundays.

During the course of his trainings, he had an opportunity to work in various departments in our factory including the beverage division, pickle division and the wine division. During the course of his training, the conduct of the student was **Very Good** and we wish the student all the very Best in the future.

Proprietor,

Signature

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*I would like to thank **Mr. Girish Minocha Sir** (CEO Minchy’s Food Products), **Mr. Uday Miocha** (Managing Director) **Mr. Virender Sir** (General Manager) **Dr. Sudhir Syal** (HoD), **Dr. Anil Kant Thakur** (Associate Professor & Coordinator of M.Sc. Biotechnology), my family, my sister (Sunidhi Dhadwal) and friend (Shivani Thakur) for their endeavoring support, consistent help and encouragement during all times whenever it was needed.*

However, above all I thank “GOD” for his grace and kindly light that has always shown on me as I moved through this venture. I owe a life-long indebtedness to him.

Akshay Dhadwal

INTRODUCTION

Minchy's is a household word in Shimla and in fact the whole of Himachal Pradesh for manufacturing and supplying finest quality Taste Enhancers. Sauces and Vinegars, Juices and RTS Beverages, Squashes and Crushes, Pickles, Jams and also fruit wines, owned by Girish Minocha, an electrical engineering graduate from Delhi College of Engineering, Delhi. Minchy's was assimilated in the year 1993.

These taste supplements are processed at their processing unit by using fresh and pure raw vegetarian ingredients obtained from the most trusted and well known fruit suppliers of the country.

Extremely admired and accepted by their national consumers for their perfect ingredients, longer shelf life, less fat and nice smell. Minchy's state-of-the-art research room is completely equipped to prepare Food Products that meet global specifications and conform to norms laid down by FPO and PFA, as well as the latest FSSAI (Food Standards and Safety Act of India.)



Nature of Business	Manufacturer
Additional Business	<ul style="list-style-type: none">• Distributer• Supplier• Service provider• Trader• Retailer
Company CEO	Mr. GIRISH MINOCHA
Total No. Of Employees	101 to 500 People
Year of Establishment	1993
Annual turnover	₹ 5 to 10 crore

With the direction of their adroit professionals and support of highly reputed suppliers of raw material, Minchy's is able to present our quality approved taste supplements in national market. To meet with the rapid growing demands of all residential clientele and their vendors they have sectioned infrastructural activities in several units like testing, processing, RM store, obtainments, sales & marketing and administration. Acquisition of the fresh fruits and alternative material for these supplements is often done under the steerage of our food engineers. Moreover to this, their clients can avail these fruit products at nominal costs. Minocha industries is indulged in manufacturing and supplying finest quality of

Fruit juice/ RTS Beverages

Juice is a beverage produced using the extraction or squeezing of the characteristic fluid contained in fruits and vegetables. It can likewise allude to liquids that are enhanced with concentrate or other organic food sources. Juice is normally consumed as refreshment or utilized as a fixing or enhancing in food sources or different drinks. The overall handling technique for juices incorporates

- Washing and arranging food source
- Juice extraction
- Straining, filtration and clarification of juice
- Blending purification
- Filling, fixing and sanitization
- Cooling, marking and packing

Apple natural juice

- Made from scrumptious fresh crunchy and delightful apples from Kashmir and Himachal
- 100% natural apple juice with no added sugar
- Unfiltered and is unique in its category
- Unique blend of Himalayan apple used

Mango juice

- Made from the choicest mango pulp from south India

Litchi juice

- Made from the unique shahi variety of litchis

Plum juice

- Made using the ripe, Santa Rosa variety of plums from Himachal.

Kiwi Juice

- It is processed with the seed intact to preserve the fiber and nutrients

Strawberry juice

- Made from delicious strawberries got from foothills of the shivalik mountains and processed within 12 hrs of harvesting

Guava juice

- Made with thick pulp and including seeds and peel

Pineapple juice

- Made with pine apple pulp either from north east India or from the mountains of Karnataka

Orange Juice

- Made from fresh ripped oranges from south India

Fruit Squash & Syrup

Squash even known as dilute/ cordial non-alcoholic and non-fermented concentrated syrups utilized for making refreshments. These are produced using organic product squeeze, sugar or sugar substrate and water

Just add water in the ratio 1:3 of water

Syrup is basically sugar dissolved in water, with or without flavors

Lemon Squash (200 kg)

- In a vessel add 70 Kg of invert sugar
- After invert sugar add 25 kg of lemon pulp and mix thoroughly
- After mixing add 500 gm citric acid
- After citric acid add KMS 900 gm
- After adding KMS add Narda mist 250 ml
- And mix it properly
- At last add 250 ml of flavor

Rhodo Squash(300kg)

- ❖ In a vessel add 210kg of invert sugar
- ❖ Then add 50 kg of rhodo pulp
- ❖ After adding pulp add 4 kg of citric acid and mix thoroughly
- ❖ After C. Acid add 300 gm of KMS
- ❖ Then add 40 gm of carbonize color
- ❖ At last add 450 ml rhodo flavor

Available in:

- Orange
- Pine apple
- Mango
- Lemon
- Litchi
- Rhodo
- Rose syrup
- Brahmi syrup

Peach Black Iced Tea (200 Kg)

- In a vessel add 22.500gm of invert sugar
- Then add 100lt of hot water (90⁰ C) and mix them properly
- Then add 600 gm tea
- After adding tea add 260 gm citric acid and 40 gm of potassium sorbet
- After mixing all ingredients add 40 gm lemon juice conc.
- After adding conc. Add 100gm of peach flavor and mix it thoroughly
- At last add 5 ml of caramel for color

Crushes & Concentrates

To make crush and concentrate, entire fruit are washed, cleaned, and squashed or mixed to deliver a mash. The greater part of the water content is then removed and dissipated.

Minchy's fruits crushes are available in 8 flavors. They required to be mixed with water in the ratio 1:6

Litchi Crush (300 kg)

- ❖ In a vessel add 180 kg invert sugar and 50 kg of dry sugar
- ❖ After invert sugar and dry sugar add 60 kg litchi pulp and mix it with the help of wooden ladle
- ❖ After mixing add 20 kg liquid glucose for stickiness
- ❖ After glucose add 250 gm xanthium gum for thickness
- ❖ Then add 3200 gm citric acid , 300 gm KMS, 100 gm of Ascorbic Acid and mix it thoroughly
- ❖ After mixing all ingredient 500 ml narda mist for shining and mix
- ❖ At last add 140 ml rose white for fragrance and 240 ml litchi flavor for taste.

Available in:

- Strawberry
- Guava
- Pineapple
- Mango
- Kiwi
- Litchi
- Apple

Apple Cider Vinegar

Apple cider vinegar is generally squeezed apple juice, yet adding yeast transforms the sugar in the juice into alcohol. This is an interaction/process called aging. Microorganisms transform the liquor into acetic acid. That gives vinegar its sharp taste and strong smell.

- Natural ,raw, non filtered
- With natural mother of vinegar
- No artificial acetic acid or water is added
- Standardized quality of natural brewed acidity at 4%

Wonder Wyne

Wonder wyne are matured in their winery using imported yeast. It is made from exclusive fruits from Himalayas only natural generated alcohol content is made without using flavor color and preservative.

Formation Process:

Starting from the initial stage in a tank

- ❖ In 2000ltrs tank 200 kg of pulp is being added with 500 kg of sugar
- ❖ About 1600 to 1700 gm DAP (diammonium phosphate) is added prior to fermentation or during stationary growth phase of yeast.
- ❖ The total soluble content is being measured at this stage and it should be around 23 to 24 i.e. the sugar content of wine is 23 to 24 %
- ❖ After measuring the sugar content of wine yeast is introduced or added and rest for 4 to 8 weeks
- ❖ After 8 weeks wine is ready to filter and then filled in a glass bottles.

Filtration process:

Filtration is the way toward eliminating solids from liquid by section across or through a permeable medium. The viability of filtration relies upon particle size and filter medium porosity. Materials suspended in fluid will stay on or in the filter medium if they are bigger than the pore opening. There are three fundamental kinds of filtration:

- Primary filtration
- Secondary filtration
- Final filtration

Primary filtration:

Primary filtration is also known as Diatomaceous, diatomite or kieselgur/kieselguhr. It is a normally occurring, siliceous sedimentary rock that has been disintegrated into a fine white to grayish powder. It has a particle size less than 3 μ m to more than 1 mm.

The pores inside and between the cell wall of diatomaceous earth are so little, they trap microbes, mud particles, and other suspended solids. This leaves the wine cleaner and with radically decreased solids and impurity levels.



Fig. Diatomaceous Earth filter



Fig Diatomaceous Earth

Secondary filtration:

Secondary filtration is also known as supradisc module filter. Stacked disc modules have a protracted history in Food and Beverage industry. Because of the overall high dirt holding capacity and filtration performance of sheet-based items, they gave an ideal and practical answer for taking care of food and refreshment liquids.



Fig. Supra disc Filter

Final filtration:

It is also known as cross-stream filtration/ Profile Filter. This filter consists of two cartridges made up of polyvinylidene fluoride (PVDF). It disinfects wine by holding all yeast, microbes in the cartridges. The first cartridge is known as onoclear filter which has cartridge size of 0.65 μm and is specially used for red wine. The second cartridge which has cartridge size of 0.45 μm , known as onopure and used for white wines and other wine.



Fig.ProfileFilter

Minocha Industries is one of the famous ventures of the business indulge in manufacturing and providing best quality Taste Enhancers. Sauces, vinegar, juices, RTS beverages, squashes and crushes are some of the products that Minocha industries manufacturing. These taste supplements are handled at their preparing unit by utilizing fresh and unadulterated vegetarian ingredient acquired from most trusted and well known fruit supplier of the country. Extremely admired and accepted by their national consumers for their perfect ingredients, longer shelf life, less fat and nice smell, these are exceedingly applauded in the across country market. The various works done by me in the industry was

- Preparing & Packaging of Juices
- Prepare Tomkin Sauce
- Prepare Apple Concentrate
- Check the acid and KMS content in Juices
- Loading of Barrel
- Dispatch of products

Preparing & Packaging of Juice

Apple Juice (500lts)

- Crush the fresh apples and make the apple juice
- Rest the juice over night (24 hrs)
- Next morning boil the juice at 40 to 50 Degree
- Add the enzymes (Pectinase and amylase) 5 ml each
- Boil again at 80 to 85 degree
- Then add aroma 250 to 300ml
- Pack the juice in bottle

Mango Juice (500ltrs)

- Add 150 kg mango pulp in a tub
- Add 150 kg invert sugar in the pulp and mix it thoroughly
- Add Xanthan gum(300gm), pectin(300gm; for stickiness and thickness) and citric acid(1800gm) and mix it with the help of ladle

-
- Then add ascorbic acid(100gm) and potassium sorbet(200gms)
 - After that add Nard a mist(400 ml) and mix it thoroughly
 - At last add Flavor (350 ml) and Color(15 gm)
 - Then pack the juice in bottles and pasteurized 20 min

Packing

- Ready juice bottles are washed with water
- After washing juice is ready to screen
- Damaged bottles or juice having impurities is discarded
- Clean bottles is packed in a box
- Mark the box with the juice name
- Sign of the packaging person

Preparation of Tomkin Sauce (500ltrs)

Token sauce is a continental sauce made from pulp of carrots and apple

- Firstly Apple pulp or carrot pulp is added in a steaming kettle (300kg)
- Then add 12 kg of salt in pulp
- After adding salt add 110 kg of sugar
- Add 75ml spice oleoresin, 40 ml capsicum oleoresin and 3.5 lts paprika oleoresin
- Mix the ingredient finely
- Then add xanthium gum 650gm
- When xanthium gum is added add 150 gm sodium benzoate
- After sodium benzoate add 2 kg corn starch
- Add each 375 gm of onion and garlic powder
- At last add potato powder and mix all the ingredient and left for 15 to 20 min in kettle.

Apple Concentrate (500 kg)

- ❖ Add 300kg invert sugar in a vessel
- ❖ After invert sugar add 400 gm sodium benzoate
- ❖ Add water in it around 20,30 ltrs.
- ❖ Then add KMS around 200 gm
- ❖ Then add citric acid equals to 6 kg
- ❖ Caramel 500ml
- ❖ Green Apple flavor 300ml

When all things are add then mix it properly so that no lumps should be visible.

Measurement of Citric Acid Concentration

It is done to check the citric acid content present in the juice

Following were the steps involved in Acid measurement

- Take a conical flask
- Add 10 ml of juice and add 10ml of water in it
- Add 2-3 drops of phenolphthalein in flask
- Mix thoroughly
- Then keep the flask under sodium hydroxide sol and start the titration process
- Note down the initial reading and final reading than calculate the result.
- Formula used is:

$$\text{Final reading} - \text{Initial reading} \times 0.6$$

KMS Test

KMS stands for Potassium Meta bisulphate ($K_2S_2O_5$). It is a type of titration test done with the iodine solution

Steps involved are:

- Take a flask
- Add 10ml juice and 10 ml water and mix it properly
- Add 2,3 drops phenolphthalein in flask and mix
- Keep the flask under iodine solution and note down the initial reading and final reading then calculate the results
- Formula used is:

Final reading – Initial reading X 64/10

Loading of Barrels

- The prepared food material is packed in barrel
- Then the barrel is washed with water
- After washing barrel is kept aside for drying
- After drying barrel is cleaned
- After cleaning proper seal & labeling is done
- After seal and labeling the barrel is ready to transport and dispatch.

Industrial training carried out at Minchy's Food Product on 17th Feb, 2021 to 30th April, 2021. In this 75days of training the primary target behind training was to make us aware about how various activities related with food items, products, food handling, packaging, and marketing, are completed in an organization and give us the vibe of Biotechnology Application..

We were guided by Mr. Sunil to the production house where briefing of a company was given by Mr. Virender about history and main products of the industry

As a food company Minchy's is active in Himachal Pradesh especially in Solan and Shimla District. Their greatest asset is their brand and its value.

After introduction we were headed by one staff member of the company who helped us to understand how production is carried out and how company reaches its customer.

Maximum production in industry is done by machinery in various activities like initiation of raw materials, blending measure, pasteurization, covering the item and afterward converting it into finished products. At last finished product are packed and are sealed where item batch no is embellished for its future confirmation whenever required.

It is aforementioned said that “see & know” is better than “peruse & learn”. We have incredible feel of company's working after this training. We got an opportunity to transfer our theoretical knowledge to practical implication. This will even assist us to understand subject matter clearly in future too.