BHARATHIDASAN UNIVERSITY

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Programme : M.Sc., Biochemistry

Course Title; FOOD PROCESSING TECHNOLOGY

Course Code : BC001VAC

Unit – II
BEVERAGES

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BEVERAGES

Non- alcoholic beverages

Carbonated:

- Carbonated drinks, also known as fizzy drinks or soda, are beverages that have dissolved carbon dioxide gas in them. The carbon dioxide is what gives these drinks their bubbles and signature fizz. Eg. Soft drinks like orange soda, Lemon-lime soda. Sparkling water, tonic water.

Non carbonated:

- Non-carbonated drinks offer a wide variety of refreshing and flavorful options to quench your thirst without the fizz. Eg. Coffee, tea, Milk and dairy Alternatives , fruit juice etc.

Processing of Tea:

- **Camellia sinensis**
- Types of tea:
- Green tea
- Black tea
- White tea
- Oolong tea

PLUCKING:

- Tea leaves and two young leaves are hand-picked, typically twice a year.

WITHERING:

- The freshly picked leaves are allowed to dry in cold breeze room to remove the moist and make it more favourable.

DISRUPTION/ LEAF MACERATION:

- The dried leaves are now allowed to rolling, tearing and crushing.

OXIDATION/FERMENTATION:

- The volatile compounds in leaves changes into theaflavin and thearubigin where former gives brishkness and brightnesss while the later gives fullness to the liquor that produced to the tea.
- Controlled oxidation – specific flavor and aroma to tea.

FIXATION OR KILL GREEN:

This is done to limit the leaf oxidation at desired level by moderately heating it.

ROLLING:

- The heat fixed leaves are gently rolled depending on style , they are shaped into wiry, kneaded and tightly rolled pellets. The essential oils and saps got oozed out.

DRYING::

- It is done to finish for sale like sunning, air drying or baking which enhance tea flavor and it’s self-life.

CURING:

- Some tea are kept for ages and fermented for years like wine. Eg. Chinese pu-erh.

COFFEE AND COCOA PROCESSING

- Coffee, one of the world's most popular beverages .The process of turning coffee cherries into the beans we grind and brew involves several key stages, each with a significant impact on the flavor profile of the final cup.
- The Coffee Plant and Harvesting: Harvesting coffee can be done manually or mechanically. In manual harvesting, workers pick the ripe cherries by hand, ensuring that only the mature fruit is collected.
- This method allows for selective picking, which is important for maintaining quality, as overripe or underripe cherries can negatively impact the taste.
- In contrast, mechanical harvesting is often used in larger farms, especially in regions with flat terrain, but it tends to be less selective and can result in a mixture of ripe and unripe cherries.

- **Coffee Processing Methods**

Once the cherries are harvested, they must be processed to extract the beans. There are two primary methods of processing coffee: **wet processing** and **dry processing**. Each method affects the final flavor of the coffee, influencing factors such as acidity, body, and clarity.

- **Wet Processing (Washed Coffee);** In the wet processing method, the coffee cherries are first sorted and cleaned to remove any debris or damaged cherries.

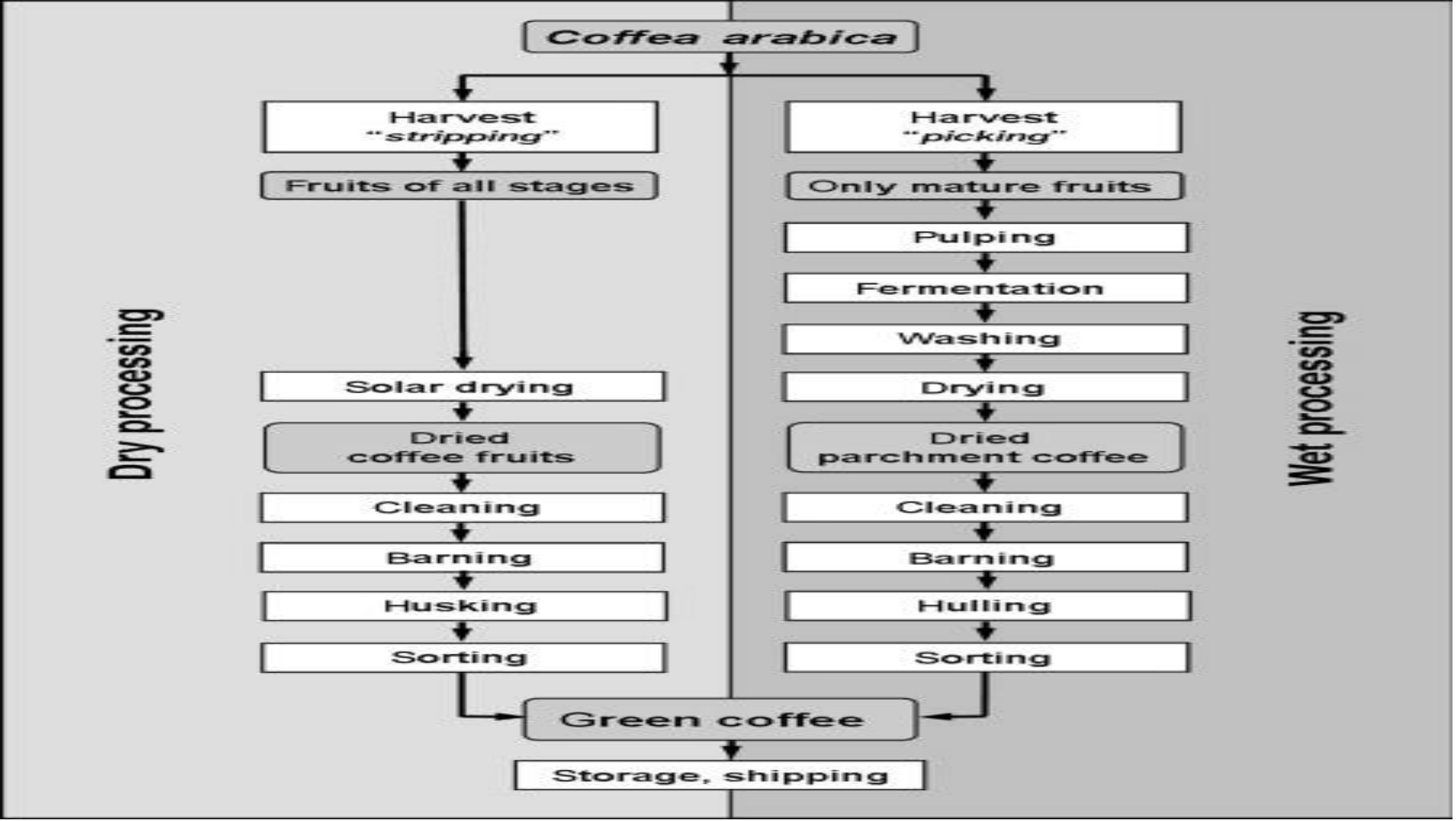
- The cherries are then pulped to remove the outer skin, leaving behind the mucilage-covered beans. After pulping, the beans are soaked in water for a period of fermentation.

- During fermentation, the natural sugars and mucilage on the beans break down, making it easier to remove the remaining pulp. This process is called "fermentation" and typically lasts between 12 and 48 hours, depending on environmental conditions.

- Once fermentation is complete, the beans are washed thoroughly to remove any residual mucilage. After washing, the beans are dried, either by spreading them out under the sun or using mechanical dryers.
- Wet processing is known for producing clean, bright, and fruity flavors in coffee, with a more pronounced acidity.
- The method also tends to highlight the inherent flavors of the beans, making it popular for high-quality Arabica coffees.

- **Dry Processing (Natural Coffee)**
- Dry processing, or natural processing, is the oldest and most traditional method of coffee processing.
- In this method, the entire coffee cherry is dried in the sun, either on large patios or raised beds.
- The cherries are often spread out in thin layers and regularly turned to ensure even drying. This process can take anywhere from one to three weeks, depending on the weather conditions.

- Once the cherries are fully dried, they are hulled to remove the outer layers, revealing the coffee beans inside.
- The dried fruit and skin left on the beans during the drying process contribute to a fuller-bodied coffee with more pronounced sweet, fruity, and sometimes even wine-like characteristics.
- Dry processing tends to highlight the more rustic, earthy flavors of coffee and is common in regions with limited water resources or where wet processing is less feasible.


Coffea arabica
Dry processing
Harvest "stripping"
Fruits of all stages
Solar drying
Dried coffee fruits
Cleaning
Barning
Husking
Sorting
Wet processing
Harvest "picking"
Only mature fruits
Pulping
Fermentation
Washing
Drying
Dried parchment coffee
Cleaning
Barning
Hulling
Sorting
Green coffee
Storage, shipping

- **Cocoa Processing: From Bean to Chocolate**

Harvesting: Cocoa pods are harvested from cacao trees when ripe, and the beans are extracted from the pods, along with their surrounding pulp.

Fermentation: The beans, still covered in pulp, are placed in containers to ferment for 5-7 days. Fermentation is crucial for developing the beans' flavor and reducing bitterness.

Drying: After fermentation, the beans are spread out in the sun to dry, typically for 1-2 weeks, reducing their moisture content to prevent spoilage.

- **Roasting**: The dried beans are roasted at high temperatures to enhance their flavor. Roasting also loosens the outer shells, which will be removed in the next step.
- **Winnowing**: The roasted beans are cracked open, and the outer shells (husks) are separated from the edible nibs through a process called winnowing. The nibs are ground into cocoa liquor.
- **Grinding and Pressing**: The cocoa nibs are ground into a smooth paste (cocoa liquor). The cocoa liquor is then pressed to separate cocoa butter (the fat) from the cocoa solids, which are ground into cocoa powder.

- **Chocolate Production**: To make chocolate, the cocoa liquor is mixed with sugar, milk (for milk chocolate), and other ingredients.
- The mixture is refined, conched (mixed and aerated), tempered (cooled to stabilize cocoa butter), and then molded into bars or other products.


Cocoa Beans
Cleaning
Roasting
Crushing and Peeling
Grinding
Cocoa Mass / Liquor
Pressing
Cocoa Oil
Cocoa Cake
Filtration
Coarse Crushing
Cooling
Fine Crushing
Cocoa Butter
Cocoa Powder

Tea-waste utilization as feed for livestock and poultry

INTRODUCTION

TEA-WASTE

- The wastes derived from tea factories are called tea waste. This waste includes discarded tea leaves, buds and tender stems of tea plants. If the tea waste is not disposed properly, it can pollute the environment like soil, water and air.
- Effects of Tea Waste:
- Factory tea wastes have a little bit pollution effect on the environment. Caffeine of tea waste is responsible for the acidity of soil and ultimately it effects on the quality of tea.

Types of Tea

and Popular Varieties

Black Tea

Made from the Camellia sinensis tea plant – fully or almost fully oxidized

POPULAR VARIETIES

- Assam Tea
- Earl Grey Tea
- Darjeeling Tea
- English Breakfast Tea

Green Tea

Made from the Camellia sinensis tea plant – unoxidized

POPULAR VARIETIES

- Matcha
- Dragonwell Green Tea
- Sencha
- Gunpowder Green Tea

Herbal Tea

Made from infused dried herbs, fruits, and flowers

POPULAR VARIETIES

- Hibiscus Tea
- Peppermint
- Chamomile Tea
- Yerba mate

White Tea

Oolong Tea

Rooibos Tea

How to use the tea-waste in different manner?

- Used tea leaves as **food.**
- used as a **deodorizer, cleaning, skin care, art** etc…,
- Tea leaves for **gardening and composting**.
- It is rich in micro-nutrients, tea waste is also studied for agricultural applications and reported to be beneficial for **soil and plant growth**.


How To Make Used
Tea Leaves as Fertilizer

- **By using Feed for Poultry and Pig:**

One can use the factory tea waste after the separation of caffeine. Decaffeinated tea waste has the immense potentiality for the preparation of poultry and pigs' feed.

Factory Tea Waste showing the highest level of tannic acid beyond 5% has a deleterious effect on the growth and performances of broiler chicken .

Tannic acids possibly act as anti-nutritive factors in broiler chicken, so the existence of tannic acid in tea waste might perturb the growth of those animals.

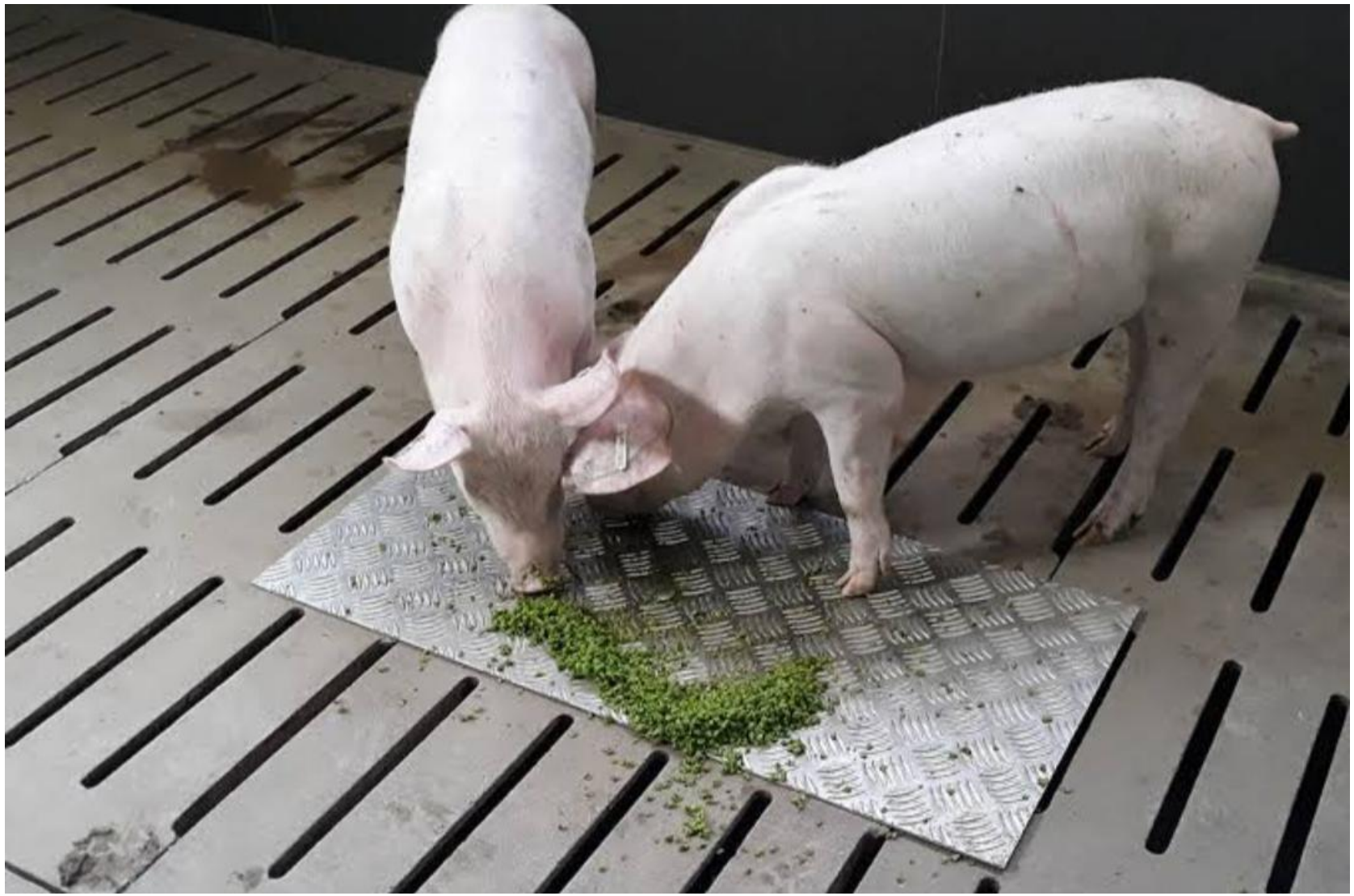
This kind of food also increased the immune response in finishing pigs and increased the egg laying capacity in hens.

- By using the Feed for Fish:

Locally, one can use the decaffeinated tea waste as a fish feed with the mixture of mustard cake and water, as revealed from our survey report.

By using for Bio-nutrient and Bio-fertilizer:

Most of tea factories of this area utilized their tea waste in the plantation area. Due to caffeine, tea waste increases the acidity of soil. But if we mixed the factory tea waste with 5% urea and cow dung for at least 45 days and kept in soil, then it will be converted into a good bio-nutrient and bio-fertilizer. Tea waste also contains significant amounts of n-triacontanol. The compound n-triacontanol has tea plant growth promoting properties and might also regulate different other physiological properties like the formation of leaf primordial and development of primary leaves.



Conclusion

- Tea waste is an important byproduct of different tea factories of this region. The huge amount of such by product should be utilized in various ways by arranging fruitful management program by factory owners.
- Tea Board of India also instructs the tea growers and factory owners to manage those byproducts and also trained the people towards alternative utilization of such good amount of tea waste for production of caffeine for pharmaceutical companies and after caffeine extraction as feed for domestic animals

Tea waste utilization as Feed for Livestock and poultry

TEA WASTE

- The large scale availability of tea waste of Camellia assamica and Camellia sinensis in this region the research work on utilization of the tea waste both Factory tea waste (FTW) and Decaffeinated Tea Waste (DCTW) as a source of feedfor livestock and poultry.
- The toxic substances present in Factory Tea Waste and Decaffeinated tea waste and innovation of suitable methods for removal of toxic substances, palatability, nutritive value and the performances of various categories of Cattle (growing and lactating),

pigs (growing and finishing) and Poultry (Broiler) were conducted on long term basis.

- Tea leaves contain high concentrations of antioxidants such as polyphenols and policosanol as well as minerals and vitamins.
- Factory Tea waste contains 6.3% tannic acid which interferes with protein metabolism.
- Factory Tea Waste which contains tannic acid is one of the limiting factors for the utilization of this byproduct in livestock feeding.
- Increasing intake of tannic acid content present in the diets as tannin has some growth inhibiting property.

However, when Factory Tea Waste soaked with water for overnight at the rate of 1:50 dilution the tannic acid content of FTW could be completely removed.

- **Decaffeinated Tea Waste (DCTW)**
- Decaffeinated Tea Waste (DCTW) is the waste available the Caffeine factories after the extraction of caffeine from Factory Tea Waste. The interesting feature of this

  Industrial waste is that it contains little quantity of tannic acid (0.4–1.0% on a DM basis)9
- If the DCTW is washed with boiled water, then it becomes good feed for Poultry,Pig and Fishes.

Degree of removal of tannic acid

Sample	% DM basis	
	Tannic acid	CP
I. Untreated FTW	6.3	19.48
II Treated FTW		
a) 1 : 10 dil.	4.83	19.45
b) 1 : 15 dil.	3.42	19.43
c) 1 : 20 dil.	2.10	19.02
d) 1 : 30 dil	0.92	18.88
e) 1 : 50	Nil	18.45

Feed for fish

- The decaffeinated tea waste (DCTW) as a fish feed with the mixture of mustard cake and water.
- DCTW contains eight Times llesser tannic acid content than FTW, so DCTW can be effectively used as fish feed for growth and development .
- **Feed for pig and poultry :**
- **After the separation of caffeine from tea waste, it has immense potential for the Preparation of pig and poultry feed. (DCTW)**
- Factory tea waste showing the highest level of tannic acid beyond 5% has a deleterious effect on the growth and performances of broiler chicken.
- Tannic acid is possibly act as anti- nutritive factors in broiler chicken , so the existence of tannic acid in tea waste might Perturb the growth of those animals
- This kind of food also increased the immune response in Pigs and increased the egg laying capacity in hens.

CHEMICAL COMPOSITION OF FTW & DCTW

Nutrients	FTW	DCTW	Spent tea
Dry matter	90.52	90.27	-
Crude protein	19.48	17.94	25.00
Ether extract	1.37	0.33	3.53
Crude fibre	11.05	12.64	8.60
Nitrogen free extract	60.52	60.01	57.00
Total Ash	7.58	9.08	5.87
Sol. Ash	6.45	7.92	-
Insol. Ash	1.13	1.16	-
Calcium	5.46	5.61	1.5
Phosphorus	0.84	0.80	0.53

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THANK YOU