

Different kind of food products development and physicochemical analysis

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Abstract

Present report is about different kind of food products development and physicochemical analysis. In this report different kind of raw food material is processed and products are developed by using their standard recipes. Standard procedures how to conduct these products physicochemical analysis and discussed here.

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Keywords: agriculture research, postharvest technology, wheat, pulses production, packing materials, malnutrition

Introduction

Ayub Agricultural Research Institute (AARI)



Ayub Agriculture Research Center (AARI) came into being in 1962 (President General Ayyub Khan) on the branching of Punjab Agricultural College into separate teaching, and research establishment Punjab Agricultural College came into being in 1905 also called as Lyallpur Agriculture college before Pakistan existence (in 1906 Lyallpur research institute). The institute has undergone evolution to build up human capabilities which has played a vital role in boosting research efforts to meet the needs of increasing population and accelerated industrial and to serve the farming community. In 1906 Lyallpur Research Institute and Punjab Agriculture College both splits in 1962 and Lyallpur Research Institute changed to Ayub Research, and Punjab College changes to Agriculture University. Main campus located at Faisalabad whereas 150 ecological specific research institute, research station, substations, testing centers, service laboratories, and research demonstration forms are located throughout the province of Punjab.

Objectives of AARI: The primary objectives of AARI are outlined below

- a. Genetic improvement of crop varieties.
- b. Continue up gradation of production technology of plant variety to control disease and insect pests.
- c. Processing, preservation and postharvest technology of fruit and vegetables.
- d. The introduction of new plants to diversify agriculture base.
- e. Regulatory aspects, dissemination of knowledge and provision of raw seeds and fruit plants to end users.
- f. Provision advisory services to firm holders, entrepreneur, industrialist provision of the exporter, stakeholder and common people.

AARI developed more than 100 varieties of wheat since 1962 as well as 8-10 potential sugarcane varieties that are about 10-12 feet long, Cotton and Rice (basmati, super kernel). The latest variety of wheat is Ujala that is more

common in Pakistan. Maxi Pak is a short height wheat combination of Pakistani and Mexico wheat. Other varieties are Pasban, Seher, Shafaq, Punjab and Lasani. Yellow Rust, Black Rust, Spike Rust are problems of Seher Wheat. Pakistan is weak in oilseed and pulses production.

Food technology section

More than 1500 units of the food industry are working with 23,500 employees nationally. Food Technology section was established in 1968 under the scheme "Shifting, expansion and intensification of agricultural research". Additional facilities using staff and machinery were provided for the streamlining of research studies on fruits and vegetable processing during the year 1973-1974. In addition to this, the government in the financial period 1981-1982 sectioned a research project on the 'development and standardization of soft drinks" based on the local technology" during 1983-1984, under the project entitled "Date development research station, Muzaffargarh" undertaking the research study on curing processing and packing of dates were approved. A research project on the "Provision of laboratory equipment and other facilities or food microbial studies" was sectioned during the year 1985. "Establishment of fruit and vegetables preservation technology transverse center " was launched during the year 1987-1988 with the financial assistance of women division government of Pakistan for three years.

Mission: Ayub Agricultural Research Institute mission is to evolve new varieties and to develop the technology for food safety, food security and sustainable generation of exportable surplus, value addition and conservation of natural resources.

Objectives: The primary objectives of Food Technology Section are

- To conduct research and new development work on different aspects of fruit and vegetables for their valueadded products.
- b. To access the laboratory findings on pilot plant protection to introduce new products.



- c. To render technical advisory services and solve problems encountered by the new and existing food entrepreneurs and food processing industries.
- d. To educate farmers and new entrepreneurs to develop cottage industry, while importing technological knowhow of food preservation.
- e. To discriminate the research, publications, English Urdu articles, small brochures and booklets to create awareness among the scientist, farmers, educationalist, exporters, stakeholders and ordinary people.

The salient features of the food technology section are

- a. Studied shelf life of selected semi-processed cutvegetables.
- b. Standardized carbonated and non-carbonated mulberry drink.
- c. Studied various packing materials on quality changes in nether region peach candies.
- d. Developed iron and zinc fortified Kino Mandarin Drink with Moringa Oleifera leaf extract.
- e. Developed and optimized processing techniques of intermediate moisture musk melon chunks.
- f. Utilized mango leaf powder in cookies to mitigate malnutrition.
- g. Studied packing material on quality attributes of guava leather.
- h. Developed and standardized RTS aloe Vera lemon functional drink.
- i. Developed and standardized onion paste at ambient storage.
- j. Studied storage stability of fresh olive leaves extracts for carbonated beverages.
- k. Studied anti-browning agents on semi-processed fresh-cut potatoes.
- 1. Produced and standardized tomato concentrated juice for home and industries.
- m. Developed different herbal tea formulation.
- n. Developed Kino Mandarin Juice Concentrate through vacuum concentrate technique for RTS drinks.
- o. Accessed shelf prolongation of novel tomato juice.
- p. Developed grape juice concentrates through vacuum concentrate technology for RTS drinks.
- q. Developed carbonated black ice tea beverage.
- r. Developed diabetic drink from the bitter gourd.

Post-harvest technology

The yearly production of fruits and vegetables is about 6.57 million tonnes and 4.93 million tonnes from an area of 1.27 million hectares in Pakistan reported in Fruits, Vegetables and Condiments Statistics of Pakistan.¹ Only

citrus and mango occupy 48% of all production of fruit. Different mango varieties are, Sindhari, Dusehri, Anwar Ratol (exportable), Chunsa, white Chunsa, Black Chunsa, and Summer Bahisht Chaunsa.

In Sargodha district, more than 200 grading, packing and waxing units working for citrus fruits. Mangoes are exported to Mexico, Gulf, Canada, Russia, Iran, Europe and Saudi Arabia. The main competitor in the export of Rice and Kino is India. Citrus canker is a disease in which peel has brown spots and insect's trips is a disease in which insects suck soluble matter from citrus fruit. Bamosis is a semisolid secretion of matter from the stem, affecting the yield. According to various statistical data available 30-40% of the value of fruit and vegetables are lost before they reach to the final consumer with worth economic lost up to 31 billion rupees in Pakistan.

Importance of fruits and vegetables: Fruit and vegetables are a part of the human diet since the dawn of time. Although most societies have tended to get diet through animal sources. Nations with regional and economic factors have a greater dependence on fruit and vegetables. With the assistance of modern nutritional sciences, the profile of fruit and vegetable has risen considerably and health professionals particularly in developed countries are actively recommending increase consumption of fruit and vegetables and restricted use of animal feed to decrease the consumption of saturated fats, to control the obesity, coronary heart disease while dietary fiber is considered beneficial in reducing or preventing the human disease like chronic and rectal cancer, diabetes, hemorrhoids, gallstones and diverticulitis. By adequate consumption of fruits and vegetables 2.7 million deaths can be saved.²

Ranking of countries in production of fruits and vegetables

- a. China
- b. India
- c. USA
- d. Brazil
- e. Turkey

FAO report (2004) (Table 1)³

The average world trade related to fruit and vegetable juices is nearly 4 thousand million US dollars per annum. However, these crops are living biological system. They will deteriorate after harvest. The rate of deterioration will vary and depends on environmental changes, cultural practices etc.

Post-harvest has two sections under

- a. Food technology
- b. Biochemistry

If the shelf life is more the grower will gain more profit or more return, and the primary purpose is to give the farmer more profit.



Table 1 Area wise Pakistan	ranked 36 all	over the world.	Ranking
of Pakistan for other crops			

Crops	Ranking
Citrus	11 th
Rice and Millet	13 th
Pistachio	14^{th}
Chickpea	3 rd
Cotton	4^{th}
Sugarcane, okra, chilies	5^{th}
Mango and Guava	6^{th}
Apricot and Dates	6 th
Wheat and Onion	5^{th}
Tobacco, Spinach and Cauliflower	9 th
Peas and Castor oil	$10^{\rm th}$
Milk (44 billion liters annually)	5 th

Post-harvest technology (PHT) techniques

- a. Washing
- b. Waxing (waxing solutions, concentrations)
- c. Curing (lose layer around product like top upper layer of onion develop after curing)
- d. Plant growth regulators (globulins, abscisic acid)
- e. Sprout inhibitors (anti-sprouting agents, CIPC)
- f. Disinfestation (insect species that affect plant fruit flies, mites, mini bug)
- g. Disinfestation protocol development (chemicals, phosphine gas, CO₂ gas)
- h. Fumigation with gaseous
- i. Irradiation (mature technology, doses are specific for intended use)
- j. Calcium application (spraying, dipping)
- k. Controlled ripening (calcium carbide, masala we use for ripening of mangoes)
- 1. Control degreening
- m. Light or minimal processing
- n. Grading and packing

Introduction of Post-Harvest Technology department

a. PHT department was established in 1989-90 with Wheat research institute

assistance of ADB (Asian development bank) and UNDP (United Nations development program)

- b. This institute is meant for PHT research on fresh fruits and vegetables in Pakistan
- c. PHT deals with procedural management from harvest to consumption with appropriate technology
- d. To maintain the quality and quantity to fetch the maximum market price
- e. Agroclinical conditions of Pakistan ranging from "tropical to temperate" allow growing of "40 different" kinds of vegetables and "21" kinds of fruits

Post-Harvest losses

Post-harvest losses range from 25-40%

These losses bring a little return to grower, processor, trader and country suffers regarding foreign exchange.

Key objectives of Post-Harvest Technology

- a. To conduct the research and development (R&D) work on PHT and value added product.
- b. To develop and disseminate on-farm primary storage.
- c. To modernise cold storage.
- d. To introduce grading and packing technology.
- e. To perform local tracing and demonstration programme related to PHT of fruits and vegetables.
- f. To render advisory services to farmers, growers, entre preneurs, traders.

Achievement of Post-Harvest Technology

- a. Development of low-cost on-farm storage technology for potato and onions
- b. Development of hydro-cooling technology for mango
- c. Introduction to Grading
- d. R&D shelf life of fruits
- e. Carrot at 0°C for 45 days
- f. Cabbage at 0°C 70 days
- g. Tomato at 10°C for 40 days
- h. Mango Sindri at 10°C for 32 days at 85-95% relative humidity



Introduction

Research efforts for wheat improvement dates back to 1906 when Cereal Section was established at Lyallpur, which was up-graded to the status of Wheat Research Institute, Faisalabad in 1975. Wheat breeding in the subcontinent started during 1907 when a botanical survey was conducted and 25 landraces were identified among three species of wheat. These landraces provided the base for wheat research in this region and a regular breeding work was started which had resulted in the release of ten improved varieties from 1911-1965. Wheat Research Institute, Faisalabad has a glorious history. The varieties released so far are playing a pivotal role for increasing wheat production of the country in general, and Punjab in particular. In 1947-48 the country's wheat production was 2.63 million tones which reached to the level of above 25 million tones. Resultantly the country became almost selfsufficient.

The Scientists of the institute are in a continuous struggle to break the yield barriers. Their efforts are to move from green revolution to the gene revolution. The research team of Wheat Research Institute is well aware of the fact that during 2050 the 334.68 million populations will need about 37.14 million tons of wheat grain and the country must meet these requirements for its integrity.

Objectives

- a. Development of new wheat varieties as fpllows:
- b. High yield potential
- c. Disease resistance (rusts, smuts, bunts)
- d. Stress tolerance (salt, heat, lodging and shattering)
- e. Sustainability to cropping
- f. Development of Advanced Wheat Production Technology

Projects

Hot red gold salsa sauce

This product have many ingrideients which are very importan to human health point of view. Tomato (*Lycopersicon esculentum*) is grown in Pakistan throughout a year and its average yield per hectare is 9.6 tones.⁴ Tomato fruits in health point of view have high attention due to its antioxidant, lycopene and its anticancer properties.⁵ Onion have many therapeutic effects against number of diseases as antitumor, antimicrobial, hypolipidaemic, antithrombotic, hypoglycemic, cardiovascular disease and cancer.⁶



Recipe

Ingredients	Quantity used
Tomatoes	1200g
Red chilies	14g
Green chilies	6g
Onion	83g
Coriander	52g
Salt	24g
Garlic	12.6g
Vinegar	8ml
Food Preservative	1.5g
Lemon juice	2ml
Citric acid	1g

Procedure: Take all ingredients (tomatoes, fresh green chilies, coriander) washed and trimmed off stem and removed damage portion. Then trimming onion and garlic peel off and wash. Take half tomatoes of them and roasted on flame and dried red chilies also roasted in hot pan. Then blended the roasted chilies and tomatoes in blender to make the paste. Take remaining tomatoes, garlic, onion, coriander leaves and green chilies, chopped all these ingredients in equal size. Then mix the all ingredients (raw chopped ingredients and paste). Cook for 5-8 mints on medium flam. Add lemon juice and further cook for 2 minutes. Cool it and add food grade preservative, mixed well. Filling in clean dried sterilized glass jar. Sealed and Label the glass jars and store at room temperature.

Apple strawberry mix fruit leather

Fruits leathers are dehydrated sheets of fruits concentrates which have high concentration of flavor and nutrients. They are developed by drying of fruits concentrates with other agents in the form of sheets in trays at (30-80°C) for 24 hours under microwave, infrared, vacuum, hot air try drier, sun drying and solar augmented drying.⁷



Recipe

Apple 1.5kg	
Apple 1.5kg	sed
Strawberry 1.5kg	
CMC 3g	
Sugar 300g	
Citric acid 2.5g	
Food preservative 3g	
Vitamin C 0.1125g	
Pulp(Apple and strawberry) 3liter	

Procedure: Wash apple and strawberry. Remove stalk of strawberry, core of apple and remove damage portion of fruits. First of all, we cut the apple into small pieces. Then add sliced apple into water and boil it until it become soft. Then grind soft apple and after this filter through muslin cloth and attain extract. On other side grind strawberry. Mix the apple extract and grinded strawberry. Then add sugar and stirred continuously until all sugar dissolved. Take stainless steel trays, wash and dried well. Then cover the trays with preachment paper by using clipper. At the end spread thin layer of paste in the trays. Placed the trays into dryer at 50°C for 11 hours. Remove the trays from drier, cut into long strips, detach the paper, turn into round shape and packed in plastic buckets. Finally label the buckets and store at room temperature.

Soya milk



Recipe

Ingredients	Quantity used
Soybeans	1/2kg
Water	1 liter
Sodium bicarbonate	0.5g
Food preservative	1.8g
Sugar	120g
СМС	1.8g

Procedure: Take half kg of soya beans; remove straws, stones and other impurities from it. Wash it 2-3 times. Take water in a pan and beans pour in it for boiling. Boiled it for 20 minutes by adding 0.5g sodium benzoate. After 20 minutes drain the remaining water after boiling. 1 to 3 times washing of boiled beans take place. Use fresh water and soak the beans overnight. Remove the outer brane of the beans by rubbing beans with hands and grinding with water. After grinding filter the beans which give whitish liquid known as milk. Measure the milk and heat the milk and remove their topped layer. Add cardamom seed and heat the milk for 20 minutes. Then adds the food preservative and CMC. Filled into clean dry sterilized glass bottles, sealed and label the bottles. At the end store at the refrigeration temperature.

Preparation of apple butter



Recipe

Ingredients	Quantity used
Apple pulp	5.25kg
Sugar	760g
Apple cider vinegar	150ml
Conc. vinegar	5ml
Cinnamon extract	170ml
Cloves extract	5oml
Food preservative	3g
Vino color	As desired

Procedure: Take about 6 kg apples washed them and cut them into halves. Remove the unwanted and damaged parts. Cook them in water for some period until soft texture is obtained. Remove the pulp through pulper, cook pulp on low flame for about an hour. Add sugar and continuously stir with spoon to mix sugar completely. After that addition of cinnamon extract and clove extract in it. Cook this mixture for about 3-4 hours. At the end add food preservative and mix it thoroughly into the mixture. Add vino color according to requirement. Let it cool for some time. Now put apple butter into dry clean sterilized glass jars and close the lid tightly. Stored at room temperature.

Bitter gourd drink

Bitter gourd (*Momordica charantia*) has beneficial effects against diabetes mellitus which affect about 285 million



adults worldwide. Bitter gourd effects on glucose tolerance and lipid profile is an area of study by many researchers.⁸



Recipe

Ingredients	Quantity used
Bitter gourd juice	liter
Citric acid	2g
Food preservative	0.8g
СМС	lg
Lemon flavor	0.5ml
Apple green color	As desired

Procedure: Wash weight and peel the bitter guard. Again, was and weight. Apply 20% salt for de-bettering and left for overnight. Then blanched for 10 mints. Blended bitter guard into two times of water with respect to weight of bitter guard. Then homogenized the juice by adding half hot water and added all ingredients expect preservative and flavor. Stain the juice through muslin cloth. Then heated the juice and added remaining water quantity. Before filling, preservative and flavors were added. Filled it in dry clean bottles and label it.



Mulberry guava mixed fruit syrup

Recipe

Ingredients	Quantity used
Mulberry	1kg
Guava	1/2kg
Sugar	3kg
Food preservative	3g
Citric acid	2g
Chocolate color	1g

Procedure: Wash mulberry and guava with clean water. Remove guava damaged part with the help of knife. Detach the mulberry stalk with the help of hands. Both of fruits blended in the blender then made the total volume 3 liters by adding water, and then added all ingredients in guava mulberry pulp and mixing it well. Then boiling for 5 minutes. During heating added citric acid and find the brix. Brix will be around 64 brix. Then filled in clean dry PET bottles, sealed and labelled the bottle. Finally stored at room temperature in dark cool place.



Almond rich cookies

Almond nut (*Amygdalus communis* L.) contain 50% lipids of it seed weight, 22-25% protein and 11-12% dietary fiber. It has many beneficial effects on human health such as cholesterol lowering and protection against diabetes.⁹

Recipe

	Ingredients	Quantity used
	Sugar	125g
	Egg white	50ml
	Baking powder	1.5g
	Almonds	125g
	Milk	100ml
	Vanilla essence	0.5ml
	White flour	250mg

Procedure: Take fresh eggs and broken it in a plate and separate the egg white from egg yolk. Then sugar in a grinder to get powdered form. Then egg white and sugar mixed in a mixer mix it until all sugar is dissolved. Then add flour slowly in the mixer and mixed it well. Crushed the almonds. Add milk in mixer during mixing. When dough is formed then adds almonds & vanilla essence in it. Give the dough proper shape of cookies with the help of molders. Then trays are prepared for over. Light oiling of trays is done. Then placed cookies in trays and trays put into an oven. Bake it for 175°C for 15 minutes. After baking cool it, stored it in plastic buckets. Labeling is done.

Development of cardamom jelly





Recipe

Ingredients	Quantity used
Cardamom	7g
Water	700ml
Carrageenan	3.5g
Agar Agar	3.5g
Sodium Benzoate	0.375g
Citric acid	0.75g
Sugar	100g
Potassium Sorbate	0.375g
Apple green color	As per requirement
Elaichi Flavor	one drop

Procedure: First of all, take weigh cardamoms and take out seeds from them. Grind seeds in china dish. Put these grinded seeds in water and give them some time to dissolve. After that boil, the seeds and water mixture in a beaker at low flame for about 30 minutes to extract the cardamom until volume reaches to 500 ml. filter the mixture through fine muslin cloth. Now place the beaker on hot plate magnetic stirrer and dissolve sugar and citric acid at 1000 rpm. Dissolve gums by gradually increasing stirring speed up to 1500 rpm. At the end add preservatives and dissolve completely. Now put the mixture into mold of desired shape to give particular shape to jelly. Place it in refrigerator for overnight.

Development of watermelon jelly



Recipe

Ingredients	Quantity used
Watermelon juice	500ml
Carrageenan	3.5g
Agar	3.5g
Sodium Benzoate	0.375g
Citric acid	0.75g
Sugar	100g
Potassium Sorbate	0.375g

Procedure: Take watermelon juice in a beaker. Filter the juice through fine muslin cloth. Now place the beaker on hot plate magnetic stirrer and dissolve sugar and citric acid at 1000rpm. Dissolve gums by gradually increasing stirring speed up to 1500rpm. At the end add preservatives and dissolve completely. Now put the mixture into mold of desired shape to give particular shape to jelly. Place it in refrigerator for overnight.

Product development

Iced tea

Ingredients

Sugar	600g
Citric Acid	40g
Food preservative	7g
Vitamin C	3g
Black Tea	60g
Lime/Lemon flavor	24ml

Procedure: Take 2 liter of water and made black tea by adding black tea and boil for 10 minutes. Then filter it through sieve. Pour into large pan and add sugar, citric acid and mix well and make syrup. Add vitamin C at end point. Add food preservative when temperature will be 60°C-70°C and mix well. Then filter through fine cloth. Add 300ml of syrup in each bottle. At the end carbonation is done and stored at room temperature.

Strawberry drink

Ingredients

Strawberry pulp	4kg
Water	51
Citric acid	11g
CMC	6g
Food preservative	4g
Color raspberry red	0.5g
Sugar	750g



Procedure: Select fresh strawberry, wash it and remove its stalk. Then take strawberry and make the pulp in blender. On other side, we take water in the pan and boil it. Filter the strawberry pulp with fine cloth, and add in boiled water pan. Then added all other ingredients just like sugar, color, CMC etc. At the end added preservative. Then slightly cool and fill drink in bottle in cold water. Stored at room temperature.

Guava drink

Ingredients

Guava pulp	4kg
Water	51
Citric acid	11g
CMC	6g
Food preservative	4g
Guava essence	1g
Sugar	750g

Procedure: Wash guava, cut it into pieces and make the pulp in blender. On other side, we take water in the pan and boil it. Then filter the guava pulp with fine cloth, and add in boiled water pan. Then added all other ingredients like sugar, color, CMC etc. When slightly cool then added preservative. At the end fill drink in bottle. Then stored at room temperature.

Peach drink

Peach pulp	4kg
Water	51
Citric acid	11g
СМС	6g
Food preservative	4g
Sugar	750g

Procedure: Take fresh peaches, remove its peel and pit. Make pulp of peach in blender. Secondly, we take the pan and added water for boiling. Then filter the peach pulp with fine cloth, and add pulp in boiled water pan. Then added all other ingredients like sugar, CMC etc. At the end add preservative. Filled drink in bottle. Then stored at room temperature.

Strawberry sauce

Ingredients

Strawberry	3kg
Water	300ml
Sugar	1kg
Salt	10grams (13g)
Lemon Juice	70-75ml (80ml)
Food preservative	4g
Strawberry Flavor	3ml
Gum	1.5-2g
Vitamin C	2g
CMC	2g

Procedure: Wash strawberry, remove its stalk and blend the strawberry in blender. Then cook for 30 minutes and added sugar according to choice. Step by step added all other ingredients. At the end add Vitamin C or preservative. Then fill in the jar and stored at room temperature. At end add strawberry chunks.

Peri Peri sauce recipe

Ingredients

Onion	282.6g
Garlic Paste	57.1g
Red Chilies	60.8g
Whole coriander	14g
Crushed Red Chilies	18g
Lemon Juice	45ml
Salt	38.9g
Black cumin	4g
Vinegar	600ml
Oil	400ml
Gum	1.8g
Vitamin C	1g
Food preservative	1g
Citric Acid	2g
Fast red color (as per required))

Procedure: First of all, blended all ingredients except vinegar, Food preservative. Heat/cook for 5–10 minutes. When temperature reach at 50–70°C. Then add sodium benzoate and vinegar and cool it at room temperature. Then fill in jar bottles.

Strawberry fruit leather

Ingredients

Tamarind	80g
Water	220ml
Strawberry	1.50kg
CMC	1.5g
Vitamin C	0.1125g
Food preservative	0.75g
Chat Masala	3g
Black Salt	10g
Citric Acid	1g
Sugar	150g

Procedure: Wash strawberry, remove its stalk. Blender the strawberry. Then make drying tray for drying purpose. Parchment paper spread on tray and put the material on tray. Then put into dryer according to specific temperature. When leather dry then paper will be removed, and make the leather in round shape.

Bottle guard chutney

Ingredients

Sugar	1kg
Pumpkin	1kg
Crushed red chilies	4.5g
Black pepper grind	1g
Salt	22g
Cumin crushed	5g
Gram Masala	1g
Food preservative	2g
Lemon Juice	50ml

Procedure: Wash pumpkin, peel them and cut pumpkin in medium size about 1 inch. Then cut or crushed the pumpkin through processor. Then boil in slightly water until soft. When add half of the sugar and all other ingredients until the sugar syrup formed. When product attains its brix then added food preservative and fill in the jar.

Smoothie recipe(T₁)

Ingredients

Strawberry	769.9g
Yogurt	770.6g
Skim Milk	545.8g
Food preservative	2.5g
CMC	1.5g
Sugar	250g
Fast red color	according to requirement

Kiwi fruit (T₂)

Kiwi fruit weight	389g
Yogurt	400g
Skim Milk	431g/400ml
Food preservative	1.8g
CMC	0.5g
Sugar	250g
Apple green color	according to requirement
Black salt	0.5g

Pine apple fruit (T₂)

Pineapple	310.9g
Yogurt	400g
Skim Milk	300ml
Food preservative	1.7g
CMC	0.7g
Sugar	250g

Procedure: First of all, we take step by step three fruits. Then blended with yogurt and skim milk in blender. Then added sugar and other ingredients. At the end added

preservative. When mixing is done, and poured it in long neck bottles. At the end stored at cold storage at 40°C temperature.

Guava leather

Ingredients

Sugar	300g
СМС	2g
Vitamin C	0.50g
Citric Acid	4g
Food preservative	2g
Guava flavor	1ml
Apple green	as required
Aloe Vera	2g

Procedure: Take tamarind into 300ml water soaks it for half hour. Then filter in to muslin cloth attain extract. Then cook it. During cooking add 100ml water. On other hand wash guava, cut it into pieces. Then grind it. After grinding filter through muslin cloth attain juice. Then mix the tamarind extract and guava juice. Add sugar and further grinding is done. Then add other ingredients like food preservative, guava flavor, citric acid, CMC etc. Place the preachment paper on trays. Convert paste into trays and place the trays into dryer at 50-60°C.

Carbonated cardamom drink

Ingredients

Sugar	1.7kg
Citric Acid	18g
Food preservative	4.5g
Vitamin C	1g
Cardamom seed	37.50g
Color apple green	1g/half g
Cardamom flavor	4ml

Procedure: First boil the cardamom seed in water. Then sieve this and separate the water. Use muslin cloth to sieve it and then double the muslin cloth and again sieve it. Add sugar and all other ingredients in water expect citric acid at the end add citric acid and then carbonation is done.

Development of Cinnamon Jelly

Recipe

Cinnamon	12g
Water	700ml
Carrageenan	3.5g
Agar	3.5g
Sodium Benzoate	0.375g
Citric acid	0.75g
Sugar	100g
Potassium Sorbate	0.375g

Procedure: First of all, take weigh cinnamon and put them in water. After that boil, the cinnamon and water mixture in a beaker at low flame for about 30 minutes to extract the cinnamon until volume reaches to 500ml. filter the mixture through fine muslin cloth. Now place the beaker on hot plate magnetic stirrer and dissolve sugar and citric acid at 1000rpm. Dissolve gums by gradually increasing stirring speed up to 1500rpm. At the end add preservatives and dissolve completely. Now put the mixture into mold of desired shape to give particular shape to jelly. Place it in refrigerator for overnight.

Physiochemical analysis

Different kind of physicochemical analysis by AOAC¹⁰

Determination of %Acidity

Principle

Test sample is neutralized with the addition of 0.1N NaOH solution.

Apparatus and reagents

- Beaker
- Pipette
- Ph meter electrodes
- Distilled water
- N NaOH

Procedure

- Electrodes of pH meter were washed with distilled water for calibration.
- Took 10ml sample through graduated cylinder and poured in beaker.
- Added 15ml distilled water (pH 7) in that sample.
- Then added 0.1N NaOH to neutralize the sample until pH reached to 8.01 on pH meter.
- The amount of 0.1N NaOH used is noted and % acidity was calculated by the following formula.

Calculation

% Acidity = $\frac{1/10 \times \text{Equivalent wt. of citric acid} \times \text{Normality of NaOH} \times \text{Titrable value}}{\text{Weight / volume of sample}}$

Determination of ascorbic acid

Purpose

To determine ascorbic acid by titrimetric method.

Principle

Ascorbic acid is determined by oxidizing it in acid medium with 2, 6-di-chloro phenol indophenols dye to dehydroascorbic acid. Ascorbic acid reduces the indicator dye to a colorless solution. At the end point of titration excess unreduced dye is a pink color in acid solution (end point). Titer of the dye can be determined by using standard ascorbic acid solution. Then ascorbic acid in food sample can be determined by calculating using volume of titration.

Apparatus and reagents/chemicals

- Burette, pipette, beaker, volumetric flask
- Oxalic acid, ascorbic acid, dye (2, 6 Dichlorophenol indophenols), distilled water and sample

Standard preparation

- Prepared 0.1 N % standard ascorbic acid solution. For this added 0.1g ascorbic acid in 100 ml of distilled water
- Prepared 0.4 % oxalic acid solution. Added 0.4g oxalic acid in 100ml distilled water
- Dye preparation (0.04%). Added 0.04 g dye in 100ml distilled water

Procedure:

Titration for standard

- Took 1ml of standard ascorbic acid solution.
- Added 1.5ml of oxalic acid.
- It was titrated against dye solution until the end point light pink color appeared and noted the reading R1.

Titration for sample

- Took 10ml of sample and made up volume 100ml with the addition of 0.4 % oxalic acid. And filtered the solution.
- Took 10ml out of this and added 15ml oxalic acid solution to this aliquot.
- Titrated it against dye solution until light pink color appeared and noted the reading R.

Calculations

Ascorbic acid content was calculated by using the following formula:

Ascorbic acid (mg / 100 ml) =
$$\frac{1 \times R \times V \times 100}{R_1 \times 1 \times W \times V_1}$$

Where, R=Volume of dye used in titration against V_1 of aliquote.

V= Volume of aliquote made by 0.4 % oxalic acid.

R₁=Volume of dye used in titration against standard.

W=Weight/volume of sample taken.

V₁=Volume of aliquote taken for titration.

Determination of pH

Principle

Through pH meter acidity and alkalinity is determined on the basis of H and \mbox{OH}^{-} ions.

Apparatus and reagents

- Beaker
- pH meter
- Test sample



- Distilled water
- Buffer solution of 4,7and10

Procedure

- First of all pH meter was calibrated and standardized with buffer solution of known sstrength.
- At first step, rinsed ph meter with distilled water. Then dipped the electrodes in buffer solution of pH 4.
- Then again rinsed it with distilled water and wiped off. Then dipped the electrodes in buffer solution of pH 7. Rinsed it with distilled water and wiped off.
- Then dipped the electrodes in buffer solution of pH 10, rinsed it with distilled water and wiped off.
- Took the sample in beaker and dipped electrodes in food sample till constant reading and checked the stable reading appeared on pH meter.

Determination of total soluble solids TSS (Brix0)

Principle

Light passes through the food sample, reflects at certain angle, that angle of reflectance measures value which is TSS (Brix⁰).

Apparatus and reagents

- Refractometer
- Food sample

Procedure

- Washed the refractometer with distill water.
- Then placed few drops of food sample in case of liquid or small quantity of solid sample.
- Turned on the refractometer and checked the reading.
- After that turned off the refractometer and again washed with distill water.

Determination of ash

Sample preparation

- Prepare 10g of sample of biscuit
- Crushed the biscuit in powdered form

Procedure

- Take sample in crucible and burn it on flame
- Burn until all smoke is disappeared
- Set the temperature of furnace about 600°C
- Place the sample in the furnace for about 3-4 hours
- Turn off the furnace after 3-4 hours and slow down the temperature about 300°C
- At 300°C remove the sample from furnace and weigh the sample again

Ash content = $\frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$

Determination of moisture

Sample preparation

- Taka a biscuit and crushed it in to powdered form
- Take 10g of sample in Petri dish

Preparation for experiment

- Set the oven temperature at 105°C
- Cover the sample before put it in the oven

Procedure

- Place the sample in an oven for 24 hours
- After 24 hours remove the sample from oven and weigh it again and note the reading
- Differentiate the initial and final sample and divide it by initial weigh and multiply it with 100
- It give the moisture content in biscuit

Formula

 $Moisture content = \frac{Initial weight - Final weight}{Initial weight} \times 100$

Determination of sugars (reducing and non-reducing)

Sugars were determined by Lane and Eynon method and Ruck in 1963.

Reagents

- Fehling solution A: (Took 34.64g CuSO4.5H2O), and made up volume 500ml with addition of distilled water.
- Fehling solution B: (Took 173.0g of potassium sodium tartarate+50g NaOH, and made up volume 500 ml with addition of distilled water and stored for 2-3 days.
- 20 % lead acetate: (Took 20g lead acetate, and made up volume 100ml with addition of distilled water.
- Potassium oxalate: (Took 165.0g potassium oxalate, and made up volume 500ml with distilled water.
- Indicators: (phenolphthalein and methyl red indicator).

Took 1g of indicator and made volume up to 100ml by adding distilled water. (Use ethanol, if indicator like phenolphthalein does not dissolve in distilled water.)

Principle

Reducing sugar reduces Cu^{+2} (cupric ions) to Cu^{+1} (cuprous oxide) forming red color which is indication that sugar is completely reduced.

Procedure

Total sugars

- Took 50ml juice sample in a flask
- Added 10g citric acid and boiled for 10 minutes and then cooled. (pH 1.5-2)
- Then added 20%NaOH solution to neutralize it (up to 8.01pH) by using pH mete

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- Made up 250ml volume of this sample solution by adding distilled water, the solution was then filtered and took it in burette
- Took 5ml Fehling A and 5ml Fehling B solutions in conical flask, mixed and heated until boiling starts, then added methyl blue indicator (2-3 drops)
- It was titrated against sample solution. Boiling continued during titration till end point brick red color appeared
- Noticed the amount of sample used and calculated amount of total sugars from the following formula

%Total sugars =
$$\frac{\text{Fehling solution factor } \times \text{dilution}}{\text{Volume of sample used}} \times 100$$

Fehling solution factor

For this 1 % pure glucose solution was prepared and it was titrated with Fehling A and Fehling B solution to obtain this factor.

Fehling solution factor = 0.051

Volume of sample used = titratable value

Dilution = 250/50 = 5

Reducing sugars

- Took 50 ml sample in a flask
- Added 0.1 N NaOH to neutralize it (up to 8.01ph) by using ph meter
- Made 250 ml volume of this neutralized sample solution, the solution was then filtered and took it in burette
- Took 5 ml Fehling A and 5 ml Fehling B solutions in conical flask, mixed and heated until boiling starts, then added methyl blue indicator (2-3 drops)
- It was titrated against sample solution (boiled continuously during titration) till end point brick red color appeared
- Noticed the amount of sample used and calculated amount of reducing sugars from the following formula.10

%Reducing sugars = $\frac{\text{Fehling solution factor} \times \text{dilution}}{\text{Volume of sample used}} \times 100$

%Non - Reducing sugars = Total sugar% - Reducing sugars%

Determination of color parameters by colorimeter

Principle

A colorimeter is a light sensitive instrument that determines color based on the red, blue and green components of light absorbed by the food sample. When light passes through the sample, part of light is absorbed, and colorimeter gives 3 values in form of L^{*}, a^{*} and b^{*}.

Apparatus

- Colorimeter
- Food sample

Background

In 1976, the CIE recommended CIE L*a*b* or CIE lab (color scale for use). It was intended to provide a standard approximately uniform color scale which could be used by everyone so that color values could be easily compared. The CIE lab color scale is the uniform color scale in which the differences between the points plotted in the color space corresponds to the visual differences. The L* axis runs from top to bottom. The maximum for L* is 100 (white), which represents a perfect reflecting diffuser. Minimum for L* is 0, which represents black. The a* is on x-axis. If values are positive, it will show red color. If values are negative, it will show green color. The b* is on y-axis. Positive values are yellow and negative values are blue color.

Procedure

- Placed the sample on colorimeter.
- Turned it on and noticed its color values

Turned it off and washed the sensor disc with distilled water.

Conclusion

After complete our internship training. Along our training period, we realize that observation is a main element to find out the root cause of a problem. Not only for our project but daily activities too. During our project, we cooperate with our colleagues and operators to determine the problems. Moreover, the project indirectly helps us to learn independently, discipline myself, be considerate/patient, self-trust, and take initiative and the ability to solve problems. Besides, our communication skills are strengthening as well when communicating with others. During our training period, we have received criticism and advice from technologist when mistakes were made. However, those advices are useful guidance for us to change our self and avoid our selfmaking the same mistakes again. In sum, the activities that we have learned during industrial training really are useful for us in future to face challenges in a working environment. Throughout the internship training, we found that several things are important:

Critical and analytical thinking

To organize our tasks and assignment, we need to analyze our problems and assignment, and to formulate a good solution to the problem. We would have to set contingency plan for the solution, so that we are well prepared for the unforeseeable situations.

Time management

As overall technician and programmer are always racing against tight timeline and packed schedule, a proper time management will minimize facing overdue deadlines. An effective time management allows us to do our assignment efficiently and meet

our schedules. Scheduling avoids time wastage and allows us to plan ahead, and gaining more as a result.



Goal management

Opposing to a Herculean goal seemed to be reachable at first sight, it is better to sub-divide the goals to a few achievable tasks, so that we will be gaining more confidence by accomplishing those tasks.

Interactions

In working environment, teamwork is vital in contributing to a strong organization. Teamwork is also essential in reaching the goals of the organization as an entity. Thus, communicating and sharing is much needed in the working environment. Therefore, we should be respecting each other in work, and working together as a team, instead of working alone. This is because working together as a team is easier in reaching our targets, rather than operating individually.

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Conflict of interest

The author declares no conflict of interest.

References

1. Fruits, Vegetables and Condiments Statistics of Pakistan (2015–2016).

- 2. Hoejskov PS. Importance of Fruits and Vegetables for Public Health and Food Safety. 2014:1–29.
- FAO report. Ranking of Countries in Production of Fruits and Vegetables. 2004.
- Naz F, Ihasan UH, Syed A, et al. Studies on Growth, Yield and Nutritional Composition of Different Tomato Cultivars in Battal Valley of District Mansehra, Khyber Pakhtunkhwa, Pakistan. Sarhad journal of Agriculture. 2011;27(4):1–3.
- Giovannucci E. Tomatoes, Tomato-Based Products, Lycopene, and Cancer: Review of the Epidemiologic Literature. J Natl Cancer Inst. 1999;91(4):317–331.
- Ali M, Thomson M, Afzal M. Garlic and Onions: Their Effect on Eicosanoid Metabolism and its Clinical Relevance. *Prostaglandins Leukot Essent Fatty Acids*. 2000;62(2):55–73.
- Diamante LM, Bai X, Busch J. Fruit Leather: Method of Preparation and Effect of Different Conditions on Qualities. *International Journal of Food Science*. 2014.12 p.
- Parmar K, Patel S, Patel J, et al. Effects of Bittergourd (Momordica charantia) Fruit Juice on Glucose Tolerance and Lipid Profile in Type-11 Diabetic Rats. International Journal of Drug Development and Research. 2011;3(2):139–146.
- Mandalari G, Nueno-Palop C, Bisignano G, et al. Potential Prebiotic Properties of Almond (*Amygdalus communis* L.) Seeds. *Journal of Applied and Environmental Microbiology*. 2008;74(14):4264–4270.
- AOAC. Official Methods of Analysis. 14th ed. USA: Association of Official Analytical Chemists; 1984.