



**Post Harvest Research Centre
Faisalabad**



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Over View

Post Harvest Research Centre was established in 1989-90 with assistance of ADP/UNDP. The Post harvest technology deals with “produce management after harvesting till consumption” and to maintain quality and quantity in order to obtain the maximum market price. The major objective of this Research Centre is to conduct Research and Development work on the postharvest quality, safety and marketability of fresh horticultural produce and to extend the research based information to the farmers and exporters.

In 2008-9 Food Technology Section and Bio-Chemistry Section were brought under the umbrella of Post Harvest Research Centre. The Food Technology Section was established in 1968 with the objective to carry out research and development studies on processing, preservation and development of new value added products from various fruits and vegetables. This section has potentially contributed in value addition by developing food products and has trained thousands of human resources both male and female in food processing and preservation techniques. Pilot scale production and sale of various food products is another allied objective, helping to popularize the use of good quality food products among the masses, as well as to deposit handsome income annually to the government treasury.

Accordingly, Bio-Chemistry Section undertakes research, relating to nutritional evaluation of crops and provides analytical services to the farmers, scientists, industrialists and Research Institutions for quality testing of their research materials and products. It also evaluates nutritive values of different varieties of fodder crops for animal feeding and develops strategies for utilization of agro-industrial products, by-products and wastes.

Standardization of Post Harvest Protocol for Fig Fruit

Figs are highly perishable, which limits storage for long periods and different post harvest treatments are prerequisite to expand the potential markets. Figs are climacteric and slightly sensitive to ethylene action which stimulates fruit softening and decay. Low temperatures and a high relative humidity, modified Atmospheric packaging (MAP) and wax coatings are used for extending its shelf stability and quality.

The fig fruit were harvested on the basis of change in skin color. After washing with antifungal i.e 200ppm sodium hypochlorite solution and drying, figs were subjected to different post harvest treatments like hot water, wax, and MAP as per treatment plan. Then fruit were stored at ambient and cool chambers at $1\pm 1^{\circ}\text{C}$ and 95% RH.

The shelf stability of fruits was checked up to 10 weeks by physico-chemical and organoleptic evaluation at weekly basis during storage. Data regarding the skin color, specific gravity, dry matter, firmness and total soluble solid was recorded.

Fig fruits stored in MAP created by polyethylene retained their acceptable freshness up to 42 days followed by fruits treated with hot water at 40°C . However, fruits stored at ambient Conditions were deteriorated after 3 days.

At 0 day



Effect of Different Storage Techniques on Physiology of Tomato

Tomatoes have a short post harvest life due to rapid ripening and microbial decay. This study was designed to extend shelf life of tomatoes using different storage methods.

Tomatoes (hybrid variety) were harvested at mature green stage from selected farm. Tomatoes were pre-cooled, washed with 200ppm sodium hypochlorite solution and dried. Then tomatoes were subjected to various conditions of storage including low temperature storage at 10°C , CO_2 and O_2 @ 5% each and modified atmosphere packaging (polyethylene). Physico-chemical parameters (weight loss %, color, total soluble solid, Firmness, acidity and decay %) were analyzed after four days interval. Tomatoes stored in Controlled Atmospheric Laboratory Storage ($5\%\text{O}_2 + 5\%\text{CO}_2$) showed best result regarding storage life and quality parameters followed by MAP (Packed in polyethylene bags of 0.05mm) upto 60 & 40 days respectively.



At the end of storage

Effect of Low Temperature Conditioning on the Storage Quality of Pear Fruit (*Pyrus Communis*)

Pear fruit is rich in antioxidants, flavonoids and dietary fiber. Appearance of rapid post harvest browning in fruit peel and core during storage and short life span pose a challenge for their marketing. This study was planned to investigate the potential of low temperature conditioning (LTC) to inhibit peel browning and to extend shelf life of pear fruit.

After harvesting the fruits were given a low temperature conditioning at 8°C for 1, 3, 6, and 9 days respectively. Fruits without LTC treatment were regarded as control. All the treatments were stored at 0°C±1°C for acceptable period. Physico-chemical data illustrated that Pear fruit kept at 8 °C for 6 days remained best in a storage study of 42 days.

Effect of Harvesting Time on Storage Quality of Kinnow Fruit

Pakistan is among the top ten citrus producing countries of the world. "Easy peeler" citrus (Kinnow) has assumed special economic importance and export demand being acknowledged for its high juice content, special flavor, and therapeutic values. This study was planned to assess the effects of harvesting time on Kinnow fruit quality and shelf life extension. Kinnow fruit was harvested at mature stage from the Citrus Research Institute, Sargodha in three consecutive months (December, January, February). After sorting and grading fruit were immersed in hot water at 50°C for 3 minutes with antifungal Thiabendazole (TBZ) @

1000ppm. Air dried fruits were stored in Cold chambers and also in CA Lab (5 % O₂ + 10% CO₂) at 5°C and 85-90 % relative humidity up to one month. Data regarding weight loss, decay %, pH, acidity, TSS, vitamin C and juice % were evaluated at weekly basis during the storage period which revealed that Kinnow harvested in December and stored in CA showed better retention of quality parameters followed by January and February harvesting respectively.

Impact of Ca Storage on Storage Behavior and Post Harvest Quality of Litchi

Litchi is an excellent source of vitamin C, B-complex vitamins such as thiamin, niacin, and folates and minerals like potassium & copper. The project was designed to explore the effects of CA storage on the storage quality of mature litchi.

Litchi was purchased from the local market and pre-cooled by air blast cooling method. Sorting and grading of litchi were carried out manually on color, size, mechanical damage, diseases incidence and pests damage basis. Pre-cooled litchi then immersed in 200ppm TBZ solution. After subsequent drying, fruit was packed in mesh bags and stored in CA at different concentration of O₂ and CO₂ chambers at 5± 2°C and 90-95% RH for further studies. Data regarding physico-chemical parameters indicated that litchi stored in CA Lab. 4% O₂ and 7.5% CO₂ at 5°C with 90-95% relative humidity, maintained peel color and fruit firmness better than other treatments. CA storage also appears to be an effective method for decay control during

storage and has potential to maintain commercial litchi fruits up to four weeks.

Impact of CA Storage on Storage Behaviour and Post Harvest Quality of Apples

This study was aimed to explore the physicochemical behavior of apple stored at controlled oxygen and carbon dioxide level and at low temperature.



Apples (Red Delicious) were procured from



Murree Hill Fruit Research Station and pre-cooled by Reefer Container. Pre-cooled apples were immersed in Calcium Chloride solution (3%) and TBZ solution (1000 ppm) for 3 minutes. Apples were stored at various concentration of oxygen and carbon dioxide in CA chambers. The storage temperature was set at $0^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 85-95% RH for further studies. Data regarding weight loss %, firmness, TSS, acidity and color was determined at 15 days interval. Apples stored in atmosphere of 2% O_2 and 1% CO_2 showed best results for quality and extended shelf life up to 6 months

DEVELOPMENT OF EDIBLE COATING TO ENHANCE SHELF LIFE OF STRAWBERRY FRUIT

Strawberry is a non-climacteric fruit with a very short postharvest life. Quality Losses are mostly due to its relatively high metabolic activity. Fruit is susceptible to water loss, bruising and mechanical injuries due to their soft texture and lack of a protective rind. Edible coatings can extend the shelf life and improve the quality of fruits and vegetables. The aim of this study was to protect fruit from deterioration, extend shelf life and provide a barrier against hazards.

Strawberry fruit was harvested at half ripe stage from progressive farm at Sharaqpur. Fruit were pre-cooled and washed with 150ppm sodium hypochlorite solution. After that dipping was done in wax solutions of chitosan and carnauba at various concentrations for 60-90 sec. Fruits were stored at $2 \pm 1^{\circ}\text{C}$ and 95% RH for acceptable period. Fruits were evaluated for physico-chemical quality (weight loss %, color, TSS, Firmness, acidity and decay %) at 5-days interval during storage. Strawberry fruits treated with 1% chitosan and 1% carnauba coatings showed better overall performance in storage. While higher concentration of coating material cause gumminess in humid environment and enhance fruit rotting. However, decay % was higher in all treatments, so calcium salts and antifungal chemicals should be included in wax coating material to control decay problem and increase shelf stability of fruits.

FOOD TECHNOLOGY

Medicinal Value

Addition of Apple Jam



Apple jam having Medicinal properties was developed with the addition of ginger, aloe vera and black pepper in different concentrations with respect to organoleptic evaluation. Ginger at the level of 6% was ranked to be best during six months storage. Similarly for Aloe vera a concentration of 40% was ranked at the top for organoleptic evaluation. For black pepper 2.5% was ranked at the top for organoleptic evaluation.

Quality Assessment and Shelf Prolongation of Fresh Tomato Juice

An innovative product from tomato was prepared as ready to serve juice. After washing, sorting and trimming, tomato fruit was cooked and passed through fine pulper to obtain pulp. Tomato juice was prepared from pulp. Novel tomato juices were prepared following the standard recipe formula. The developed samples were filled in 300 ml PET bottles and stored at ambient storage conditions for further studies. The storage study showed that the treatment containing 25% tomato juice ranked the best regarding physico-chemical and sensory characteristics as compared to other treatment having 15%, 20% and 30% tomato juice.

Development of Grape Juice Concentrates Through Vacuum Concentration Technique for RTS Drinks

Grape juice concentrate was developed through vacuum concentration technique. Five treatments were designed by varying the concentration of citric acid and sodium benzoate. The developed samples were hot filled in 300 ml PET bottles and stored at ambient conditions to evaluate the quality parameters during storage. Different ingredients like sugar, color and flavor were incorporated in the developed grape juice concentrate for ready to serve drink.

Production and Quality Assessment of Karonda- Sweet Orange Functional RTS Beverage



Value added functional beverage was prepared by utilizing karonda and sweet orange juice in different combinations. The treatments were designed by using different ratios of karonda and sweet orange juice. After procurement of fruits from local market, the juice was extracted from both the fruit mixed together through high speed blending machine, according to the treatments. Pasteurization was done after adding sugar, preservative and other ingredients. Drink was hot filled in PET bottles of 300 ml capacity. The ready to serve Karonda-Orange functional drink so prepared was stored at ambient temperature. The physico-chemical results showed that the treatment with 70:30 of Karonda-orange juices was found the best.

Development and Storage Study of Pomegranate–Pineapple RTS Drink



Pomegranate and Pineapple drink was prepared by varying the percentage of fruit juices. After standardization the prepared drink was hot filled in PET bottles of 300 ml capacity and stored at ambient condition. The physico-chemical analysis and organoleptic evaluation showed that the treatment with 70:30 of pomegranate: juice pineapple juice was found the best

Development of Dietetic Bael-Peach Jam



Bael fruit and peach was procured locally. After washing, peeling and de stoning the fruits, pulp of fruits was prepared. The diet jam was prepared by using low caloric sweetener sorbitol. The physico-chemical analysis of all the treatments was carried out after one-month storage interval as well as the samples were evaluated organoleptically. The results showed that the diet jam prepared with 80% bael pulp and 20%peach pulp ranked best as compared to other treatment having bael and peach pulp with ratio 100:0, 90:0, 70:30 and 60:40.

Optimization of Beetroot-Orange Functional Drink



Beetroot and kinnow fruit were utilized to develop a value added drink by using different levels of sugar beet and kinnow Prepared drink were analyzed for physico-chemical and sensory characteristics after 15 days interval. The treatment with 70 % beetroot juice and 30% orange juice was found best.

Effect of Spice-Mix on the Quality Characteristics of Papaya Drink

Ppapaya based functional drink was developed with additional benefits of spices. The treatments were designed by using different ratios of papaya and spices extract (prepared from ginger and black pepper in 5:2 ratio respectively). Then papaya pulp was blended with spice extract according to the treatments and drinks was hot filled in 300 ml glass bottles and stored at ambient temperature. The prepared RTS drinks were analyzed for physico-chemical analysis and sensory evaluation after 15 days' interval during storage. The treatment having 85% papaya pulp and 15% spice extract found to be the best.

Production of Naturally Flavoured Green Mango Mint RTS Drink as Immunity Booster



Naturally flavored green mango drink was developed to find out the synergistic effect of mint on the keeping quality of RTS drink. Fruit pulp was obtained by grinding and sieving through muslin cloth. Extract was prepared in 100ml water with mint, cumin and black pepper i.e, (20:1:1) respectively. The juice and extract so obtained of both the commodities were mixed together through high speed blending machine and drink was prepared according to the standard formula and hot filled in glass bottles of 250 ml capacity. The RTS green mango-mint functional drink was analyzed for physico-chemical and sensory characteristics after 15 day interval up to maximum acceptable period. The treatment having 80% mango pulp and 20% spice extract was ranked the best.

Processing and Quality Evaluation of Coconut Based Jam with Date



A new range of coconut jam with date was developed. After preliminary operations, coconut milk was obtained through squeezing the pulp by muslin cloth. This coconut milk along with 2% fiber and date pulp was utilized in jam preparation. Jam samples so prepared

were filled in glass jars and stored at ambient temperature for further studies.

After Physico-chemical analysis the treatment having 90% coconut milk and 10% date pulp was ranked best.

Development and Shelf Stability of Carom (Carumcopticum) Cookies



Carom seeds (ajwain) were utilized to enhance the current range of cookies.

The seeds were roasted in stainless steel pan followed by grinding and sieving with 2mm mesh size to get fine powder. Carom powder was incorporated in cookies by using standard recipe accordingly. These prepared cookies were kept in polyethylene bags to study the shelf stability at ambient conditions.

Proximate analysis, sensory parameters and mineral profile was carried out after 15 days interval up to maximum acceptable period. The results showed that the treatment containing 95% flour and 5% carom powder was found best.

Development of Carbonated Anola (Phyllanthusemblica) Beverage to Combat Health Ailment



Anola commonly known as amla was utilized to explore the functional properties of fruit in carbonated RTS in combination with lime juice. The juices of both fruits were mixed

according to ratio amla: lime 100:0, 99:1, 97:3, 95:5, 93:7 and 91:9. Pasteurization was done after adding sugar, preservative and color. The drinks were prepared by mixing the carbonated water (50-60 PSI) according to the standard formula. The physico-chemical results revealed that treatment having 95% anola pulp and 5% lime juice ranked the best.

BIO-CHEMISTRY SECTION

Quality comparison of different apple varieties grown in Punjab

Sample of fifteen varieties of apple (Nugget, Amri, Masheddi, Double Red, Sky Spur, Golden, Jona gold, Star king delicious, Red golden, Spartin, King red delicious, Golden delicious, Golden russet, Ida red and Red chief) were collected from Fruit Research Station, Murree hills and analyzed for pulp, juice, seed, vitamin- C, pH, acidity, TSS, malic acid, firmness, reducing, non- reducing and total invert sugars. Reducing sugar (6.65%), total sugar (11.11%), vitamin C (5.56mg/100ml), TSS (12.9%) and pH (3.8) were found higher in Mashhadi while maximum non- reducing sugar (5.57%), acidity (1.28%) and firmness (7.23kg) were found in variety Golden.

Effect of cutting interval on crude protein, fiber content and dry matter yield of alfalfa

This experiment was conducted in collaboration with Agronomy (Forage Production) Section AARI, Faisalabad. Three stages of fodder for cutting were selected. First cutting was taken 30 days after sowing in

all treatments and then cuttings were taken after an interval of 20, 30, and 40 days after first cutting and collected samples were analyzed for crude protein, crude fat, crude fiber, total minerals and Nitrogen Free Extract (NFE). Ash content (11.0%), dry matter (22.8%) and NFE (45.9%) were found better in second cutting while crude protein (14.5%) and crude fat (5.02%) were found better in third cutting of alfalfa.

Chemical composition of Aloe vera with respect to seasonal variation

Samples of Aloe vera were collected from pots after every three months, starting from July 2016. Fresh plant leaves were used to determine gel %, and fresh gel were used to record pH, vitamin C and TSS. Plant leaves were dried and analyzed for dry matter, crude protein, crude fat, ash, crude fiber, NFE, zinc and iron. During winter (October to March, 2016) Gel percentage (68.7%) and TSS (1.21%) was higher while during summer (April to June, 2017) vitamin C (3.54 mg/ 100 ml) and crude protein (15.4%) was found maximum in various samples of Aloe vera.

Quality comparison of hybrid vs. synthetic varieties of maize and rice

This experiment was conducted in collaboration with Maize Research Station, AARI, Faisalabad, Rice Research Institute, Kala Shah Kaku and Oilseeds Research Institute, Faisalabad. Eight hybrid (FH 922, FH-949, FH-1046, YH-1899, Pearl, YH 1898, FH 988 and FH-1036) and four synthetic varieties of maize (MMRI-yellow, 30Y87, DK

6789, NT-6621) while three hybrid (Maharani 1, Maharani 2 and Sallar) and three synthetic varieties (Super Kernel, KainnatandSupri) of rice were analyzed for crude protein, crude fat, crude fiber, ash and NFE. Maharani 1 in rice was found better due to crude protein (7.68%), crude fat (1.22%), ash content (0.64%) and crude fiber (0.45%). FH-1036 in maize was found better due to higher crude fat (3.82%) and crude protein (8.49%). Overall hybrid performed better than synthetic both in rice and maize.



Assessment of antioxidant potential of different fruits

Five fruits each of summer (Mango, peach, plum, and grapes) and winter (Banana, apple, dates, guava) were collected from local market. Analysis of samples showed that pH of all the ten fruits were in highly acidic range (2.9 in plum to 4.1 in banana) except date (6.3). In summer fruits higher percentage of TSS, acidity and total phenols was observed in grapes (25%, 0.78%, 1725 µg GAE /ml respectively) while Vitamin C and antioxidants (26.67 mg/100 ml and 90.72% respectively) were found higher in mango. In winter fruits antioxidants (85.85%) and acidity (1.78%) was higher in date while phenols (482.62 µg GAE /ml) and vitamin C (180.67 mg/100ml) was found higher in guava.

Effect of different substrates on the nutritional composition of selected varieties of Mushroom (*Agaricusbisporus*)

An experiment was conducted to evaluate the effect of different substrates and their combinations on nutritional composition of Oyster (*Pleurotus* spp.) and Button Mushroom (*Agaricusbisporus*). Substrates were wheat straw, rice straw and cotton waste and their possible combinations. Results revealed that maximum dry matter (16.85 %) and crude fat (2.50 %) were observed with substrates, comprised of rice straw and cotton waste, maximum crude protein (26.60 %) was observed in substrate comprised of wheat straw & cotton waste in oyster mushroom. In case of button mushroom maximum dry matter (12.53 %) and ash (8.35 %) was observed in substrate comprised of wheat straw, maximum crude protein (19.51%) was found in mushroom grown on wheat straw and cotton waste.

Quality evaluation of ruminant's milk with reference to seasonal variation

A study was conducted to evaluate the Ruminants' milk and volatile fatty acid contents of ghee with reference to seasonal variation. Buffalo and cow milk samples were collected in every month from five farmers of Faisalabad and evaluated for different quality parameters. Results revealed that buffalo milk has maximum pH (6.86) and water contents (87.14%) in May, and maximum crude protein (4.87%) in February, while it has maximum fat (5.1%) and specific gravity (1.031) in the month of December. Moreover, ghee made

from buffalo milk has highest Reichert-Meisssl value (26.95) in December. In case of cow milk, maximum pH (6.62), crude protein (4.10%) and fat (4.4%) was observed in December, while ghee made from cow milk has maximum Reichert-Meisssl value (24.90) also in December.

Effect of irrigation frequencies and its time of application on HCN level in sorghum

The experiment was conducted in collaboration with Agronomy (Forage Production) Section AARI, Faisalabad. Irrigation was applied at different intervals (20, 30, 40 days) after sowing and data regarding HCN level and protein was recorded. Results revealed that there was non-significant difference among the treatments regarding crude protein while HCN was higher in treatments where irrigation was applied at 30 and 40 days after sowing.

Effect of exogenous application of gibberellic acid on nutritional quality of wheat under drought stress

In a pot experiment, the effect of exogenous application of gibberellic acid (GA) on nutritional quality of wheat under drought stress was studied. GA at the rate of 10^{-4} M was applied at 7, 21 and 28 days after germination. Moisture levels of pots were maintained at 40, 60, 80 and 100% of field capacity (FC). Results revealed that maximum grain yield (22.22 g/pot), crude protein (13.15%), crude fat (2.15 %) was observed at 100% FC with GA application. GA enhances

yield of wheat at all the level of field capacities.

Differential response of Mung bean (Vignaradiata) genotypes towards nutritional quality due to microbial inoculation

In a field trial, the response of 4 mung bean genotypes (Chakwal Mung-2006, AZRI Mung-06, NM-2006 and NM-2011) towards their nutritional quality due to microbial inoculation was studied. Results revealed that the varieties respond differently due to inoculation. Grain yield (1.37 t/ha) and crude protein (25.83 %) was higher in NM-2011, dry matter (95.19%) and phosphorus (0.309%) was higher in AZRI-06 while maximum crude fat (1.42%) was observed in Chakwal Mung 2006 with inoculation.

Effect of potassium on nutritional quality and yield of wheat

A field experiment was conducted to see the effect of potassium on nutritional quality and yield of wheat. Experiment comprised of four doses of potassium 40, 60, 80, 100 kg/ha. Results revealed that potassium application @ 100 kg/ha along with NP produced maximum grain yield (3.51 t/ha), ash (1.82 %), crude fat (2.21 %), crude protein (12.88 %), phosphorus (0.236 %), potassium (0.75 %) and calcium (0.036 %).

Evaluation of nutritional difference in vegetables grown in tunnels (Off season) and field condition (On season)

Four vegetables (cucumber, bitter gourd, capsicum and tomato) samples were collected from farmer's tunnels (Off season vegetable) as well as from farmers' fields (seasonal vegetables). Samples were analyzed and it was concluded that in all the four vegetables the moisture contents (97, 94.4, 98.1, and 97.4% respectively) and carbohydrates (96, 97.4, 98.1 and 97.4% respectively) were observed higher in vegetables grown in tunnels as compared to moisture contents (94.5, 91.4, 95.4 and 96.1%) and carbohydrates (93.9, 97, 95.4 and 96.5%) in the same vegetables grown in the field without tunnels.

Effect of spatial variation on nutritional quality of vegetables grown in different Tehsils of Faisalabad

Samples of cauliflower and turnip were collected from various villages of Tehsil Jaranwala and Faisalabad. Proximate analysis showed that moisture percentage (97.5, 95.2%), ash (0.38, 0.87%), fats (0.64, 0.15) and protein (1.68, 1.9%) were higher in both the vegetables collected from villages of Tehsil Jaranwala while crude fiber (0.52, 0.46%) and carbohydrates (97.7, 97.8%) were found higher in vegetables collected from villages of Tehsil Faisalabad.

Nutritional quality evaluation of fodder (wheat grass) grown by using brackish water

A field experiment was conducted in collaboration with Soil Salinity Research Institute PindiBhattian to see the nutritional quality of wheat grass fodder grown by using brackish water. Wheat grass was irrigated with brackish water alone and in combination with gypsum and H_2SO_4 @ 50 and 100 % of gypsum requirement (GR). Results revealed that Gypsum application @ 100% GR on the basis of residual sodium carbonate of water produced maximum fresh fodder yield (10.42 t/ha), ash (14.37 %), crude fat (5.40 %), crude protein (18.20 %) and phosphorus (0.310 %) while maximum dry matter (29.53 %), potassium (1.30 %) and calcium (0.081 %) was observed where H_2SO_4 @ 100% GR was applied.

Effect of Potassium on yield and nutritional quality of pearl millet fodder

A field experiment was conducted in collaboration with Fodder Research institute Sargodha to see the effect of potassium fertilizer on yield and quality of pearl millet fodder. Experiment comprised of three doses of potassium 30, 60, 90 kg/ha in combination with recommended dose of NP (70-60) kg/ha. Results revealed that Potassium application @ 90 kg/ha produced maximum fresh fodder yield (56.46 t/ha), ash (11.45 %), crude fat (1.92 %), crude protein (11.96 %), potassium (1.53 %), phosphorus (0.214 %) and calcium (0.099 %).

Nutritional quality evaluation of different varieties of Peach

Samples of eight peach varieties were collected from Hill Fruit Research Station Murree. From fruit analysis results, it was concluded that flesh (92.01%), pH (3.8), non-reducing sugar (2.12%), total sugar (7.2%), Fe (1.86%) and acidity (0.53%) was observed higher in Florida gold. TSS (15.6%), reducing sugar (5.47%), fiber (1.5%) and phosphorus (4.13%) was observed higher in peach-3. However non-significant difference was found among all the varieties in case of dry matter and K contents.



Nectarine and Spring crest

Miscellaneous Activities.

- An amount of Rs. 26.35 lacs, from pilot plant production, was deposited into the Government Treasury.
- A 21 days in-house training course was conducted.
- 425 ladies; farmers and entrepreneurs have been trained at 16 different places, throughout the Punjab province.
- 43 Radio talks were got recorded for broadcasting. 21 Advisory Services were rendered.

- Supervised 72 students from different Universities and Colleges throughout Punjab Province.
- A total of 395 samples (wheat, maize, garlic, tomato, date, cookies, beverages, maize silage, mung bean, chickpea, guar, rice, guava, ber and berseem) received from different institutes/sections were analyzed for quality parameters i.e. fresh weight, dry matter, peel, stone, pulp, nitrogen, crude protein, crude fat, crude fiber, NFE, antioxidants, phenols, beta carotene, sugar, vitamin C and mineral matter.

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