SHELF LIFE AND ACCEPTABILITY OF SELECTED FOOD MATERIALS ROASTED BY CONVENTIONAL AND SOLAR COOKING METHOD AND STORED IN SELECTED HOUSEHOLD CONTAINERS

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DEDICATED TO MY

GRAND PARENTS

PARENTS

&

BROTHERS

CERTIFICATE - I

Miss Qujista Masrur Tazeen Mohd. Intesaruddin Siddiqui has satisfactorily prosecuted her course of research for a period of not less than two years and that the dissertation entitled "SHELF LIFE AND ACCEPTABILITY OF SELECTED FOOD MATERIALS ROASTED BY CONVENTIONAL AND SOLAR COOKING METHOD AND STORED IN SELECTED HOUSEHOLD CONTAINERS" submitted by her is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the dissertation or part there of has not been previously submitted by her for a degree of any university.

Date:
23/7/90

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Guide

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CERTIFICATE-II

This is to certify that the dissertation entitled "SHELF LIFE AND ACCEPTABILITY OF SELECTED FOOD MATERIALS ROASTED BY CONVENTIONAL AND SOLAR COOKING METHOD AND STORED IN SELECTED HOUSEHOLD CONTAINERS" submitted by Miss. Qujista Masrur Tazeen Mohd. Intesaruddin Siddiqui to the Marathwada Agricultural University in Partial fulfilment of the requirement for the degree of "MASTER OF SCIENCE" (Home Science) in the subject of HOME MANAGEMENT has been approved by the student's advisory committee after oral examination in Collaboration with the external examiner.

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Dated: 23-7-1990

(Qujista Masrur Tazeen Siddiqui)

CONTENTS

CHAPTER-I

INTRODUCTION

INTRODUCTION

Home management consists of purposeful behaviour involved in the creation and use of resources to achieve family goals (Gross et al. 1980) Traditionally and culturally management of home is recognised to be the first and foremost responsibility of the homemakers. To accomplish it effectively, house wife has to play a diversified role as a planner, decision maker worker, supervisor, monitor and evaluator, in various homemaking tasks. Homemaking entails a variety of responsibilities, duties and tasks (George and Bafena 1983). Homemaking is said to be a full time job Women in general spend 10-12 hours of the day in accomplishing various homemaking activities by organizing their complicated schedule. Among these food and related activities demand more time, is one among these activities.

Food is one of the basic necessity for survival of human being. Food production is the seasonal process while consumption is continuous. Hence, produce is stored at farm and home level. (Punandam 1977).

Household is a consuming unit and hence requires a variety of perishable and non perishable food items to be stored for day to day use. The preservation of the quality of food without causing deterioration in the course of storage is important from the point of consumption.

Proper storage of food materials is an important factor in preventing its deterioration in quality and quantity. Food grains initially infested in the field itself, subsequently lead to further development of pests and pathogens in the storage.

Moisture content is one of the key factor determining the storability of the grains (Appa Rao 1977). High Moisture content is responsible for microbial activity, besides heating which contributes to the deterioration of stored grains. The distribution and abundance of various stored grains insect depends mainly on the climatological conditions of the region (Wilson et al. 1985).

In addition to suitable space right type of storage containers are important in preserving

the quality of the product without causing deterioration. The tin and plastic containers create conducive microclimate for the micro activity and multiplications of insect which left unnoticed leads to growth of organisms (Narisimhan 1977). The length of\the time foods may be held satisfactorily and without appreciable deterioration depends much on the product and its quality when stored as well as the condition of storage.

The practice of bulk purchases of the food grains such as cereals, pulses rice is gradually found to be decreasing in many families due to shortage of space and availability round the year as result of wide transport facilities. However, the practice of monthly purchase of grocery is inevitable item for almost all the families. Grocery covers a variety of food items. They are inseperable part of food budget as they are indispensable to make the food preparations delicious.

Groundnut and Samolina are indispensable items in grocery purchases among Maharashterian households due to their extensive use. A variety

of delicious preparations are made from Samolina. Besides planned recipies, quick snack preparations of Samolina are great help to homemakers to meet the emergency such as extending hospitality to the unexpected family guests, or friends. Groundnuts are invariably used in every day cooking of currys, koshimbirs and chutneys to inhance their taste both Samolina and groundnuts have therefore, a special place in the family's grocery stock. Groceries are cleaned and stored in different types of containers such as Aluminium, Glass, Tin, Plastic and recently marketed pearl pet.

Infestation of red rust botle is a common problem that is feced by the housewives in the storage of samolina. To overcome this problem and to retain the quality of the product, the homemakers roast the samolina before storing. Roasting helps to reduce moisture content, larvae and thus control infestation (Pushpamma 1977). Those possessing solar cooker prefer to roast them in solar cooker to economise time, money, energy. Some of the homemakers have experienced development of undesirable odour in solar roasted groundnut stored in plastic containers.

The validity of these experiences need to be tested in the light of the different types of containers and roasting methods. Availability of information in this aspect will help the housewives to select proper storage containers and methods and avoide wastage of food materials due to deterioration in quality and ultimately in saving resourses such as money, time and energy.

The study is therefore, undertaken with following objectives:

1. To study the shelf life of the selected food materials roasted by conventional and solar cooking methods and stored in selected household container for given period.
2. To find out the acceptability of the selected food materials stuffs roasted by conventional and solar cooking and stored in selected household containers for selected period.
3. To find out correlation between storage container storage period, roasting method and acceptability.

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CHAPTER-II

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Resume of the shelf life studies on food materials denotes very little work on the aspect of household storage. The available literature, pertinent to this study on shelf life and acceptability of the selected food materials, roasted by conventional and solar cooking methods and stored in selected household containers is presented under the following heads.

1. Storage containers, moisture content.
2. Storage containers, insect development and acceptability.
3. Drying methods and keeping quality.

2.1 Storage containers, moisture content:

The magnitude of spoilage in stored grains fluctuates under different ecological conditions. Factors such as temperature, humidity, type of food products, condition and type of storage containers and storage place determine the storability of the food products/grains. Moisture content is one of the key factor determining the suitability of grains for storage. It is reported to be affected by storage time (Gupta *et al.* 1980).

farmers from the village. The results denoted higher moisture content of the grains stored in 'Kothila'. Further the per cent loss of stored grain was also higher in 'Kothila as compared to the bag storage, under 'bhusa'.

Suitability of hessian cloth, long cloth and double rainforced brown paper as packing materials was assessed by Singh et al. (1979) for storing wheat flour. The bags filled with 5 kilogram wheat flour were placed randomly on the steel racks and others inside three metal drums. The moisture content was reported to be increased in all the three types of packages during storage.

Agrawal et al. (1981) collected 350 samples of wheat from the farmers store stocked for maximum 8 months. It was observed that minimum weight loss occured (1.07 per cent) in grains stored in pacca kothi and maximum in Bharola (6.62 per cent) which was a poor structure.

Khound and Borah (1982) experimented on three indoor storage containers viz metal bins, cement bins and 'Juria duli' fabricated from bamboo basket and polythylene lining. It was

noted that low moisture content was in 'Juria dulis' compared to metal and cement bins at the end of six months storage.

Developing domestic metal bins (Dewan type) and corrugated galvanized steel (CGS) bins, Birewar et al. (1983) studied them for wheat storage. The results revealed that the average moisture content ranged only between 11 to 12 per cent during one year storage. Both the structures were reasonably moisture proof and air tight and suitable for long period storage of grains.

Investigation of different storage structures namely metal bins, jute bags, jute bags with polythene lining, jute bags kept in wheat straw and other methods of storage (Kothi, Bharola, open rooms and parchatti) was reported by Hira et al. (1988). Sixty samples from eight villages in Ludhiana district were analysed for this purpose. The statistical analysis of this eleven months study confirmed that moisture content was significantly affected by both the storage structure and storage time. The effect of moisture changes was maximum in metal bins and jute bags kept in wheat straw followed by jute bags with polythene lining.

Storage practices were studied by Thackre and Bansode (1988) by surveying 125 farmers from 22 villages of Banda District. It was conluded that only 3 per cent farmers used pucca kothis made up of burnt bricks and cement and 73 per cent adjusted in traditional structures like earthen pots and banda while 24 per cent had metalic bins also. It was further revealed that majority of the farmers were aware of the losses occuring during storage.

2.2 Storage containers, insect development and acceptability

Insect development is a great problem in the stored products. Due to infestation the food material becomes unfit for consumption. It also may affect the acceptability of the stored product. The rust red flour beetle is one of the most common domestic pest of cereal grains, oil seeds, spices and milled product, suji, atta, maida, etc.

Kameshwar and Malthi (1968) conducted a study on wheat flour, storing it in gunny bags, polythene lined gunny bags and polythene lined

canvas bags. The data indicated maximum moisture ingress in gunny bags. Gunny bag under 100 percentage RH gave undesirable gunny odour to the flour in 2 months, and within 5 months it was found to be infested, preceeded by a visible mold growth externally. Polythene lined canvas bag was free from such flavour during entire 16 months storage period. Mold growth was observed externally on the canvas bags after 5 months. The polythene lined canvas bags were the best type of package.

Arya, et al. (1971) evaluated the shelf life of atta stored in different packaging materials and informed that atta stored in unlaminated jute and canvas bags beame moldy in 10 days. Further main spoilage of atta was due to excessive moisture ingression resulting in cake formation and musty odour.

Premevalli and Leela (1971) studied atta packed in polythene (400 gauge), canvas (200 gauge), hessian and (200 gauge) high density polythene 16 mesh. These packages were stored in ASC depots from July to January under ambient conditions. The organoleptic evaluation of chapaties from these samples was done by army units for colour, texture, taste and leavening. The atta in all 3 types of packaging materials remained in good

condition for 7 months. Cake formation and musty odour did not occur. The chapaties were acceptable in taste, colour, texture to all the units. Comparatively sample stored in polythene/canvas bags were rated better than other two.

Raj and Singh (1979) analysed village samples from a district in Uttar Pradesh and concluded that infestation of wheat by T. Castaneam had originated from the storage. The study further confirmed that with increase in period the moisture content of the stored product increased there by increasing the infestation and consequently recording higher grain loss. The percentage of loss (on weight and number basis) ranged from 1.63 to 10.73 per cent after 3 and 9 months of storage, respectively.

Singh, et al. (1979) found that in the 4 months storage of wheat flour, average number of insects were less on long cloth bags, and hence claimed to be superior packaging material than the hessian cloth and paper bag. Further it was informed that during the first months of storage there was no definate effect on the quality of the stored flour in all the bags which was found to increase during second month onwards.

Simwat and Chahal (1980) studied the stored samples from 6 farmers bulk wheat stores from two villages. The samples were collected from June to October at monthly intervals and from 3 different depths. The sample analysis depicted increase in insect population with storage period from and decrease with the increase in the depth of stored grains, causing corresponding damage to wheat.

Khound and Borah (1982) observed cement bins, as worst for insect infestation in wheat than metal bin and 'Jurie duli'. The cement bin stored grains also denoted slight discolouration and mold formation at the bottom layer.

Birewals, et al. (1983) ascertained satisfactory physical condition of the wheat stored in the Dewan type domestic metal bins and corrugated galvanised steel bins.

Leelavanthi, et al. (1984) experimented on whole wheat flour atta and resultant atta the byproduct from flour mill, by storing the samples in air tight containers. Monthly evaluation of these products for odour, taste and infestation was done by a panel of six judges. Organoleptic evaluation indicated development of musty odour in atta after 3 months storage while

in resultant atta within a month. Resultant atta also developed bitter taste, which was intensified further on storage.

Mathur and Kaushal (1984) conducted 10 days experiment on 6 varieties of groundnut and assured non susceptibility of tasted varieties to rust red flour beetle.

Patil and Shinde (1985) analysed randomly collected groundnut kernals from 6 places. The results revealed that two samples were infested with insects, while nine were moldy and 17 samples were apparently free from molds.

Brar, et al. (1987) surveyed 43 important grain markets of Punjab and Chandigarh and collected samples of oilseeds and cakes, each weighing 250 grams. Further analysis of there samples on incubation reported that groundnut and sesame oilseeds were most commonly infested by Tribolenm castaneum Herbst. The results further pointed out that only groundnuts were infested by Alphitobins Laevigatus Oliv, Tabebroides Mauritanicus Linn and Laemophloeas Manitus Oliv.

Hira, et al. (1988) observed maximum adverse results in jute bags in wheat storage while jute bags with polythene linings were as good as metal bins.

2.3 Drying methods and keeping quality

Drying is done for reducing moisture content in the products. Prior to storage, sundrying is generally practiced for most of the grains at farm and home level. With advent in technology, drying in solar oven/ cooker is advocated even at the household level for certain food materials.

Varalaxmi (1966) compared keeping quality of certain products dried in solar oven for 45 minutes with those in direct sunlight for four consecutive days. Refined wheat Ravai, refined wheat flour and Bengal gram flour were the food materials used in this experiment. The dried products were stored for 3 months in the selected containers and were inspected at 15 days intervals for keeping quality and infestation. Solar oven was significantly effective in keeping the product free from the growth of insects during 3 months storage period. The identicle samples stored after sundrying were reported for heavy infestation with beetles.

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CHAPTER-III

MATERIALS AND METHODS.

MATERIALS AND METHODS

This study was undertaken to assess the shelf life and acceptability of the selected food materials roasted by conventional and solar cooking method and stored in selected household containers for selected period. Changes in the moisture content, insect development, sensory evaluation, effect of containers and methods on stored products were the parameters focussed for the study.

Various materials used and methodologic adopted in this study are detailed under following heads:

3.1 Selection of food materials.

3.2 Collection of the food materials.

3.3 Selection of containers.

3.4 Selection of roasting methods.

3.5 Standardisation of the roasting procedure.

3.6 Experimental procedure.

3.7 Selection of the taste panle.

3.8 Developing the score card for assessing acceptability.

3.9 Recording observations.

3.10 Statistical procedure.

3.1 Selection of food materials

Wheat Ravai (Samolina) and Groundnut (Arachis hypogaea) were the two grocery food materials selected for the study because of their frequent use in various day to day preparations in Maharashtra.

3.2 Collection of the food materials

To maintain uniformity in the product for the sake of accuracy, the materials were purchased in bulk, at a time, from one local market shop. Samolina was sieved through fine sieve and cleaned, removing unsieved foreing particles. Groundnuts were cleaned. All the materials were stored in dry containers in clean, airy place for further use.

3.3 Selection of containers

Glass, tin, steel, aluminium opeque plastic and transperent plastic pearl pet were the containers selected as these were in vogue for storage of given items. Each of the type of containers were uniform in size and shape. Empty tin containers of baby food of the same company were used. All the containers had 500 grams capacity.

3.4 Selection of roasting methods

Roasting in the deep fry pan on the gas Sigari consisted of the conventional method while roasting in the reflector type solar cooker keeping the product in the black coated aluminium open boxes thus exposing it to direct solar energy comprised of solar cooker roasting method.

3.5 Standardization of the roasting procedure

Standardization of the roasting procedure for both the food materials was done for each of the methods, by taking a number of trials using variations in roasting temperature and time. These products were evaluated by the selected taste panel for colour, taste, texture and flavour and overall acceptability. The roasting temperature and time the gave optimum satisfactory results in terms of given parameters for each food materials and each method were repeated three times. Their averages mean values were adopted as standards for roasting each of the food materials to be used in the final experiment. The standardized values for time, temperature for each of the selected food materials for roasting by conventional method and by solar cooker are presented in Appendix-1.

In the conventional method the flame of gas was kept same. Dial thermameter were used to record the temperature of the food materials. Hourly record of time was maintained with the help of wrist watch, while stop watch was used for noting down minutes and seconds.

3.6 Experimental procedure

The experiment was carried out in the department of Home Management in the college of Home Science, Parbhani. The experiment was laid out by following Factorial Randomized Block Design. The required quantity of each of the selected cleaned food was roasted on the same day by conventional method and solar cooking method. On cooling down, 500 grams each of the selected food materials, roasted by each conventional and solar cooking method, were stored in selected six types of containers seperately, each in three replication.

The experiment was conducted in dry, well ventilated room at the room temperature 21°C to 35°C and relative humidity 60 % to 86 %. The experiment was carriedout for five weeks. It was initiated on twenty first May 90 and terminated on Twenty sixth June 1990.

3.7 Selection of the Taste Panel

A taste panel of ten members, comprising of academic staff and post graduate students was selected by administering threshold taste as per the procedure described by Swaminathan (1974) Appendix-II. The panel was retained through out the experiment to assess the acceptability of each of the product, stored in triplicate.

3.8 Developing the score card for assessing acceptability

A score card was developed using five point scale, as recommended by Swaminathan (1974) to assess the acceptability of the stored food materials. The parameter's for the evaluation comprised of colour, texture, flavour taste and over all acceptability (Appendix-II).

3.9 Recording observations

Following observations were recorded ;

i. Percentage of moisture content

ii. Development of infestation

3.9.1 Percentage of moisture content in the selected food materials

Percentage of moisture content in the food materials was determined weekly following air oven method of A.O.A.C. (1975) clean, flat

bottom, weighing bottles were dryed at 100°C for 2-3 hours, in oven, keeping the vent open. It was then removed, covered and allowed to cool at room temperature by keeping in desicator for 15 minutes. The bottle was then weighed, filled with five grams ground samples, covered and kept in the oven. After 3 hours, it was removed and cooled in desicator for 15 minutes and reweighed. The process was repeated till the successive weights were constant. The loss of weight was calculated as per cent moisture.

3.9.2 Development of insect

Internal surface of the containers were visually inspected per week for the presence of insects besides ten grams of samples from each type of containers from each replications. At the time of termination of the experiment complete sample of Samolina, in replications were sieved through fine sieve, while all groundnut replication were examined for damage on and within, to determine insect development.

3.10 Statistical Procedure

The statistical analysis of the data was carried out by the applying Factorial Design (three-way classification) and as per Snedecor and cochran. (1967)

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CHAPTER-IV

RESULTS AND DISCUSSIONS

RESULTS AND DISCUSSIONS

The study was undertaken to find out the shelf life and acceptability of the food materials roasted by conventional and solar cooking methods stored in selected containers. Moisture content, development of insects and acceptability were the aspects of the study. The data on the various aspects of experiment was consolidated, tabulated, statistically analysed and presented under the following heads.

1. Shelf life of the selected food materials roasted by conventional and solar cooking methods and stored in selected containers for given period.
2. Acceptability of the selected food materials roasted by conventional and solar method and stored in selected household containers for selected period.
3. To find out relation between storage containers, storage period, roasting method, and acceptability.

4.1 Shelf life of the selected food materials roasted by conventional and solar cooking method and stored in selected household containers for given period.

4.1.1 Moisture content:

Moisture content of conventional and solar cooker roasted samolina in selected containers at weekly intervals is presented in table No.1.

As seen from table 1, initial 3 per cent moisture content in conventionally roasted samolina increased gradually in all containers from the Ist week reaching maximum at the IVth week and decreased in Vth i.e. last week end. Maximum moisture content was observed in Aluminium container followed by Glass, Steel, Plastic opaque, Tin and Pearlpet.

Similar trend of increase up to IVth week and there by decrease in Vth week was observed in solar roasted product was well, keeping the same order of containers. The decrease in moisture content at the end of Vth week may be attributed to the changes in atmospheric temperature and humidity.

Table 2 illustrates the moisture content of conventionally and solar roasted groundnut in

Table 1. Weekly moisture percentage in roasted samolina in selected containers.

Sr. No.	Method/ Container	Conventionally roasted samolina moisture percentage						Solar roasted samolina moisture percentage					
		Initial	After I week	After II week	After III week	After IV week	After V week	Initial	After I week	After II week	After III week	After IV week	After V week
1.	Pearlpet	3	3.4	5.0	6.20	7.50	5.20	3.01	4.1	5.9	6.8	8.9	5.4
2.	Plastic opeque	3	4.5	6.10	8.00	9.30	6.90	3.01	4.5	7.7	9.0	10.5	7.6
3.	Aluminium	3	6.0	7.50	10.50	12.50	9.30	3.01	7.1	9.0	11.0	13.0	10.5
4.	Steel	3	5.2	6.80	7.80	10.00	7.50	3.01	5.3	8.0	9.5	11.2	8.4
5.	Glass	3	5.8	7.10	9.20	10.80	8.30	3.01	6.8	8.5	10.5	12.5	9.3
6.	Tin	3	4.0	5.00	6.90	7.90	6.50	3.01	4.3	6.4	7.9	9.2	6.1

selected containers. As evident the steady increase occured upto the end of IVth week in the initial 2.9 per cent moisture content of the conventionally roasted groundnut in all containers which decreased in Vth week end. The moisture content was maximum in Aluminium container and Glass, Steel, Plastic opaque, Tin and Pearlpet were next in order.

The solar roasted groundnut had initially 3.12 per cent moisture content. It raised upto end of IVth week and lowered down at the end of Vth week in all containers. The similar order of containers was noted for maximum moisture content. The fall in moisture content at the end of Vth week may be due to changes in atmospheric temperature and humidity.

4.2.2 Development of infestation:

Presence of insects was observed nil in all containers in conventionally and solar cooker roasted samolina and groundnut sample through out the storage period. Similarly, 10 grams each of samolina and groundnut drawn from each containers in replications every week were free from insects. Emergence of insects in sieved samolina and the

Table 2. Weekly moisture percentage in roasted groudnut in selected containers.

Sr. No.	Method/ Containers	Conventionally roasted groundnut moisture percentage						Solar roasted grouddnut moisture-percentage					
		Initial	After I week	After II week	After III week	After IV week	After V week	Initial	After I week	After II week	After III week	After IV week	After V week
1.	Pearlpet	2.9	4.0	4.2	6.00	8.00	5.00	3.12	4.50	6.00	7.50	9.00	6.10
2.	Plastic opaque	2.9	4.8	5.01	7.00	9.00	7.20	3.12	5.00	6.90	8.40	10.00	7.30
3.	Aluminium	2.9	5.8	7.80	9.80	12.00	9.00	3.12	3.00	8.10	10.20	12.50	10.00
4.	Steel	2.9	5.0	6.00	8.00	10.00	8.10	3.12	3.00	7.20	9.10	11.00	8.10
5.	Glass	2.9	5.6	6.80	8.60	11.00	8.40	3.12	9.00	7.80	9.50	11.50	9.50
6.	Tin	2.9	4.4	4.00	6.20	8.50	6.40	3.12	9.00	6.20	7.70	9.30	6.50

damage on and within the groundnut was nil at the end of the termination of the experiment i.e. end of Vth week.

It is therefore concluded that no insect development occured in any container in conventional and solar roasted samolina and groundnut when stored for 5 weeks.

4.2 Acceptability of the selected food materials roasted by conventional and solar cooking method and stored in selected household containers for selected period.

The sensory evaluation determining acceptability of the conventionally and solar roasted samolina and groundnut during the 5 weeks storage in the selected containers is given in the following tables.

Table 3 depicts the average acceptability score at the begining and after one week of storage.

As noted the initial values of conventionally and solar roasted samolina recorded maximum score, for each parameter leading to highest total acceptability scores.

At the end of Ist week the conventionally roasted samolina stored in Pearlpet, Plastic opaque,

Aluminium, Steel, Glass and Tin containers obtained average total score 4.92, 4.89, 4.18, 4.94, 4.89 and 4.92 respectively. For colour maximum score was observed in Pearlpet followed by Plastic opaque and Steel having identical score (4.96) and lowest score (3.03) in Aluminium. Maximum and minimum score for odour was denoted in Tin (4.88) and Aluminium (4) respectively. Both Pearlpet and Steel as well as Glass and Tin had identical higher values (4.96 and 4.92) for taste. Samolina stored in Steel container claimed maximum value (5) for texture and also for over all acceptability alongwith Glass and Tin followed by Pearlpet (4.96) Plastic opaque (4.92), Aluminium (4). On the basis of maximum total acceptability score, Steel ranked Ist indicating, highest acceptability of the product followed by Pearlpet and Tin both in IInd rank while Plastic opaque and Glass each at the IIIrd position and Aluminium the last.

The total acceptability score for solar roasted samolina was 4.80, 4.08, 4.18, 4.78, 4.65 and 4.84 respectively when stored in Pearlpet, Plastic opaque, Aluminium, Steel, Glass and Tin containers. Identical maximum values were reported for samolina for colour, in Plastic opaque and Glass

Table 3. Average score of acceptability of roasted samolina initially and after one week storage.

Sr. No.	Initial score/ Score after one week in container	Conventionally roasted samolina						Solar roasted samolina					
		Colour	Odour	Taste	Texture	Overall acceptability	Total scored	Colour	Odour	Taste	Texture	Overall acceptability	Total score
		5	5	5	5	5	5	5	5	5	5	5	5
1.	Pearlpet	5.00	4.78	4.96	4.92	4.96	4.92	4.8	4.84	4.84	4.73	4.81	4.80
2.	Plastic opaque	4.96	4.77	4.88	4.92	4.92	4.89	4.85	4.88	4.80	4.84	4.88	4.80
3.	Aluminium	4.03	4.00	4.00	4.88	4.00	4.18	4.00	4.00	4.00	4.00	4.77	4.18
4.	Steel	4.96	4.80	4.96	5.00	5.00	4.94	4.79	4.68	4.8	4.92	4.73	4.78
5.	Glass	4.88	4.81	4.92	4.85	5.00	4.89	4.85	4.00	4.78	4.82	4.84	4.64
6.	Tin	4.92	4.88	4.92	4.89	5.00	4.92	4.84	4.86	4.88	4.81	4.84	4.84

(4.85), while for odour 4.88 in Plastic opaque, Tin (4.86) and pearlpet (4.84) and the lowest values in Aluminium and Glass (4). Similarly the product in Tin (4.88)had highest score for taste while for texture, it was noted in Steel (4.92) and lowest in Aluminium (4). Product in Plastic opaque showed maximum overall acceptability and steel product minimum. Corresponding the maximum total average acceptability scores, the order of container was Tin, Pearlpet and Plastic opaque, Steel, Glass and Aluminium the last. None of the parameters scored full value in the solar roasted samolina in any container. The score for conventionally roasted samolina was higher than the solar roasted in all containers except Aluminium which was at par.

It is therefore concluded that at the end of the Ist week the conventionally roasted samolina was more acceptable than the solar roasted in all the containers except in Aluminium. Further, Glass stored product was most acceptable in conventional roasting while Tin stored in solar roasting.

Average acceptability score of the roasted samolina at the end of IInd week is reported in Table No.4.

As evident total score of conventionally roasted samolina did not show much variation among all containers. Maximum score for colour was 4.8 in Tin and Aluminium 4.89, while for odour 4.77 and 4.43 were the maximum and minimum scores in Glass and Steel product respectively. Tastewise storage in Steel container scored highest (4.93) followed by Pearlpet (4.84), Tin (4.81), while Plastic opaque denoted lowest value (4.40). Storage in Pearlpet container acquired maximum (5) score for texture followed by Glass (4.92) and minimum in Tin (4.73). In overall acceptability, Steel and Glass had similar maximum score (4.78 and 4.73), while Tin and Pearlpet denoted identical score (4.63) followed by Aluminium (4.54) and Plastic opaque (4.50). In maximum total score Glass container ranked first, followed by Pearlpet, Aluminium and Steel, while both Plastic and Tin had lowest ranks.

Colour of solar roasted samolina in Aluminium and Glass reported at par higher values (4.89 and (4.88) while in Pearlpet lowest value (4.06) were achieved. Similarly, highest values for odour were secured in Tin, while for taste, the product in Steel and Plastic opaque container had identical

and maximum score and Glass had minimum. Texturewise Plastic opaque and Aluminium were maximum and at par followed by Tin. Product in Glass denoted lowest value for taste and texture. Overall acceptability score was highest in Steel stored samolina, Pearlpet being the next while Tin the least. The total maximum acceptability score was recorded in the descending order for the product in Aluminium, Tin, Pearlpet, Steel, plastic opaque. As noted the average total score of conventionally roasted samolina was higher in all containers compared to that of solar roasted.

It is inferred that at the end of two week storage, conventionally roasted samolina had better acceptability than solar roasted samolina. Further storage in Glass followed by steel had highest acceptability in conventional method while in solar roasting it was for the product in Aluminium followed by Tin.

Table 5 illustrates the average acceptability values for colour, odour, taste, texture and overall acceptability of samolina in different containers at the end of IIIrd week of storage.

Table 5. Average score of acceptability of roasted samolina after third week storage.

Sr. No.	Method & characters/ Containers	Conventially roasted samolina						Solar roasted samolina					
		Col-our	Od-our	Taste	Tex-ture	Over-all accep-tabi-lity	Total score	Col-our	Od-our	Taste	Tex-ture	Over-all accep-tabi-lity	Total score
1.	Pearlpet	4.76	4.64	4.71	5.00	4.72	4.77	4.76	4.48	4.07	4.16	3.81	4.25
2.	Plastic opaque	4.80	4.68	4.74	4.78	4.71	4.74	4.78	3.43	3.67	3.31	3.81	3.80
3.	Aluminium	4.78	4.69	4.84	4.78	4.68	4.75	4.79	3.78	3.56	3.71	3.77	3.92
4.	Steel	4.80	4.47	5.00	4.96	4.88	4.82	4.70	4.05	4.38	3.81	3.86	4.16
5.	Glass	4.70	4.67	4.80	4.70	4.79	4.73	4.78	3.77	3.63	3.74	3.77	3.93
6.	Tin	4.78	4.71	4.81	4.80	4.70	4.76	4.27	3.65	3.60	3.70	3.77	3.79

As observed, score for colour in conventionally roasted samolina was at par among all containers, while steel storage denoted lowest values (4.47) for odour and highest (5) for taste. Texturewise product in Pearlpet followed by Steel stored scored highest values. Overall acceptability score was observed to be highest in steel (4.88) and lowest in Aluminium (3.68). Product stored in Steel container recieved maximum total acceptability score which did not vary much among other containers.

The colourwise solar roasted samolina obtained higher, at par scores in all containers except Tin (4.27). It was interesting to note that figures for odour, taste and texture in all containers were less than 4 except pearlpet and steel. Overall acceptability in all the containers ranged between 3.77 to 3.86. The highest total acceptability score for solar roasted samolina was assigned to Pearlpet (4.25) followed by Steel (4.16) and Glass, Aluminium, Plastic opaque and Tin were next in order.

It is discussed that except colour, maximum and minimum values for all other parameters denoted remarkable differences for the products roasted by selected methods. The score for conventional

roasting was comparatively higher, Further Steel and Pearlpet products were most acceptable in conventional roasting while product in pearlpet in solar roasting respectively at the end of IIIrd week.

Evaluation of various acceptability parameters at the end of the IVth week is presented in Table 6.

As evident the conventional roasted samolina had scored between 3.84 to 3.46 for colour with highest in Aluminium and Glass. Values for odour, taste, texture figured less than 3 in all containers except Pearlpet for taste and texture, Steel for taste and overall acceptability and Glass too for taste. Highest average total score placed, Steel at top (3.35) while Tin (3.07) Plastic opaque (2.98) Pearlpet (2.9) Glass (2.9) Aluminium (2.83) followed in order next.

In solar roasting only colour and odour obtained highest values i.e. 3.14 in Aluminium and Tin (3.14 and 3.83) respectively. Score for all other containers, even for texture was less than three, which was further lowered below 2 except in Tin (2.63). In overall acceptability score steel

Table 6. Average score of acceptability of roasted samolina after four week storage.

Sr. No.	Methods/ Containers	Conventional roasted samolina						Solar roasted samolina					
		Colour	Odour	Taste	Texture	Overall acceptability	Total score	Colour	Odour	Taste	Texture	Overall acceptability	Total score
1.	Pearlpet	3.46	2.6	3.00	3.16	2.42	2.92	2.18	1.35	1.44	2.27	2.37	2.10
2.	Plastic opeque	3.81	2.01	2.40	2.83	3.80	2.98	2.78	1.65	1.67	2.14	2.24	2.09
3.	Aluminium	3.84	2.63	2.30	2.70	2.68	2.83	3.14	2.49	1.52	2.83	3.35	2.60
4.	Steel	3.77	2.70	3.59	2.84	3.88	3.35	2.88	2.88	1.60	2.78	3.4	2.70
5.	Glass	3.84	2.37	3.55	2.60	2.63	2.90	2.64	2.75	1.32	2.70	3.03	2.40
6.	Tin	3.81	2.63	1.6	2.64	2.61	3.07	2.51	0.83	2.63	2.56	2.53	2.39

product held upper position followed by Aluminium and lowest in Plastic opaque. The maximum total score was 2.7 for the product in Steel container followed by Aluminium, Glass, Tin, Pearlpet and Plastic opaque in order.

As evident, at the end of IVth week of storage, maximum and minimum values for conventional and solar denoted much variation in the score for colour,odour, taste, texture explaining deterioration of the product. Comparatively total score of conventional roasted samolina was higher in all containers assuring better acceptability than solar roasted samolina. Among the containers Steel remained at highest position in both the methods while Tin and Aluminium secured IInd position in conventional and solar respectively.

The average acceptability score for roasted samolina at the end of Vth week of storage is presented in Table 7.

As viewed ,the conventionally roasted samolina still held good score for colour with maximum in Glass (3.84) and minimum in Pearlpet (3.46). The score for odour ranged between (2.7) Steel and

Table 7. Average score of acceptability of roasted samolina after fifth week.

Sr. No.	Methods/ Containers	Conventionally roasted samolina						Solar roasted samaline					
		Colour	Odour	Taste	Texture	Overall acceptability	Total score	Colour	Odour	Taste	Texture	Overall acceptability	Total score
1.	Pearlpet	3.46	2.6	3.00	3.16	2.62	2.62	2.18	2.35	1.44	2.37	2.37	2.1
2.	Plastic opeque	3.81	2.07	2.40	2.83	3.80	2.98	2.78	1.65	1.67	2.14	2.24	2.09
3.	Aluminium	3.84	2.63	2.30	2.70	2.68	2.83	3.14	2.49	1.52	2.83	3.35	2.60
4.	Steel	3.77	2.70	3.59	2.84	3.88	3.35	2.88	2.88	1.60	2.78	3.40	2.70
5.	Glass	3.84	2.37	3.55	2.60	2.63	2.90	2.64	2.75	1.32	2.70	3.03	2.40
6.	Tin	3.81	2.53	3.83	2.63	2.56	3.07	2.51	2.63	1.60	2.64	2.65	2.39

(2.07) Plastic opaque. Similarly, good score was observed for taste in pearlpet, steel, Glass, Tin and for texture in Pearlpet, all other containers being less than 3. The overall acceptability average score was highest in steel and lowest in plastic opaque. The maximum total acceptability score placed Tin (3.07) at Top following plastic opaque (2.98) Glass (2.9), Aluminium (2.83), and Pearlpet (2.62).

As detailed, the solar roasted samolina received less than 3 score for colour in all containers except Aluminium (3.14). Values for odour, texture were low ranging between 2.88 and 1.65 and 2.27, 2.83 respectively, which were further lowered for taste (1.67 to 1.32) indicating deterioration.

The overall acceptability scores were higher and similar in Aluminium and Steel (3.35 and 3.4) and lowest in Plastic opaque (2.24). Maximum average total acceptability score was at par in Steel and Aluminium (2.6 - 2.6) and lowest in Plastic opaque top position following Aluminium, Glass, Tin, pearlpet and Plastic opaque next in order.

As percieved there was much variation in the maximum and minimum score of conventional and solar roasted samolina for colour, taste and odour. Comparatively in all containers, values for conventional roasted samolina were higher than solar roasted which was revealed in the total acceptability score also. It is therefore implied that conventionally roasted samolina had better acceptability than solar roasted in all the containers at the end of the five week of storage.

The average acceptability score of groundnut roasted by conventionally and solar cooking method after one week is presented in table 8.

It describes acceptability score of conventional and solar roasted groundnuts at the begining and after one week of experiment. The initial score was maximum for both the methods. In the conventional method maximum score for colour was noted both in Pearlpet and Aluminium (5) and lower in Glass (4.83). While odourwise and taste wise, the product respectively in Steel and Pearlpet containers scored maximum. Groundnut in Pearlpet and Plastic opaque denoted maximum score for texture, while Pearlpet also had maximum rating for overall

Table 8. Average score of acceptability of roasted groundnut initially and after I week storage.

Sr. No.	Initial score/ Score after one week in container	Convention at roasted groundnut						Solar roasted groundnut					
		Colour	Odour	Taste	Texture	Overall acceptability	Total score	Colour	Odour	Taste	Texture	Overall acceptability	Total score
		5	5	5	5	5	5	5	5	5	5	5	5
1.	Pearlpet	5.00	4.80	5.00	5.00	5.00	4.96	4.82	4.68	4.84	4.93	4.81	4.81
2.	Plastic opaque	4.96	4.84	4.79	5.00	4.93	4.90	4.79	4.78	4.78	4.89	4.89	4.82
3.	Aluminium	5.00	4.79	4.85	4.85	4.83	4.86	4.88	4.52	4.52	4.84	4.89	4.60
4.	Steel	4.96	5.00	4.96	4.92	4.96	4.96	5.00	4.58	4.85	4.88	4.85	4.83
5.	Glass	4.83	4.83	4.65	4.96	4.86	4.82 4.59	4.59	4.84	4.96	4.82	4.85	4.81
6.	Tin	4.96	4.86	4.85	4.96	4.84	4.89	4.81	4.78	4.86	4.81	4.88	4.82

acceptability. The maximum total acceptability score was noted in decreasing order for the products stored in Pearlpet as well as Steel (4.96), Plastic opaque (4.90), Tin (4.89) and least in Glass (4.82).

The solar roasted groundnuts achieved maximum (5) score for colour when stored in steel and minimum in Glass (4.59). On the other hand Glass storage reported maximum scores for taste (4.96) and odour. While maximum scores for texture was in Pearlpet product. Identical scores (4.89) were noted for overall acceptability for products stored in plastic opaque. Which were compatible with tin. The maximum total score was claimed by the product kept in Steel (4.83), followed by both Plastic opaque and Tin (4.82), Pearlpet and Glass (4.81) each and Aluminium being the last (4.60).

As obvious, conventionally roasted groundnut illustrated higher total scores than that of solar roasted groundnut in all the containers thereby conveying better acceptability at the end of the first week. Further, Steel container performed best for storage of both types of roasted products while pearlpet had compatible position in conventional.

Acceptability score for conventional and solar roasted groundnut in the selected containers at the end of IInd week of storage is depicted in the table 9.

As noticed, the maximum score 5 was noted only for colour and odour in Tin and Steel container respectively. The maximum and minimum values for taste, texture and overall acceptability ranged between 4.93, 4.77, 4.92, 4.79, 4.88 and 4.74 respectively. The total acceptability scores for groundnut in all container, did not show much variation. The maximum score was alloted for the product stored in Steel, Tin and Pearlpet being next in order and Glass and Plastic each at the IV position and Aluminium at Vth and the last position.

The maximum score for colour in the solar roasted groundnuts was claimed by the product in plastic opaque (4.84) though Steel also had similar values (4.83). For all selected containers, values for taste ranged between 4.88 to 4.77 and for texture 4.92 and 4.30. The overall acceptability score highlighted highest position for Steel and Tin, while Glass and Plastic were adjascent to each

Table 9. Average score of acceptability of roasted groundnut after second week storage.

Sr. No.	Method/ Containers	Conventional roasted groundnut						Solar roasted groundnut					
		Colour	Odour	Taste	Texture	Overall acceptability	Total score	Colour	Odour	Taste	Texture	Overall acceptability	Total score
1.	Pearlpet	4.96	4.45	4.71	4.82	4.82	4.85	4.71	4.85	4.82	4.92	4.80	4.83
2.	Plastic opeque	4.82	4.79	4.81	4.92	4.88	4.84	4.84	4.59	4.82	4.78	4.84	4.77
3.	Aluminium	4.92	4.80	4.82	4.79	4.74	4.81	4.70	4.98	4.84	4.30	4.78	4.72
4.	Steel	4.96	5.00	4.81	4.92	4.80	4.89	4.83	4.68	4.88	4.73	4.88	4.80
5.	Glass	4.96	4.78	4.88	4.83	4.76	4.84	4.76	4.88	4.77	4.76	4.84	4.72
6.	Tin	5.00	4.82	4.93	4.79	4.85	4.87	4.80	4.82	4.88	4.88	4.78	4.82

other, followed by Pearlpet and both Aluminium and Tin at the same lower level.

It is briefed that the total score for acceptability was slightly higher in all the containers for conventionally roasted groundnuts denoting better acceptability than the solar roasted product at the end of the IInd week. Further, it was asserted that steel and Tin scored Ist and IInd position for acceptability of the product in conventional method while it was vice versa in solar roasting.

Assessment of the acceptability of the roasted groundnut at the end of IIIrd week of storage is stated in Table 10.

As presented in the table, the only maximum score noted in conventionally roasted groundnut was for taste and texture in Steel and Pearlpet containers. The average score for colour did not vary much while differences were notable for texture in all the containers. Lowest score was observed in the Pearlpet for odour and taste. The overall acceptability ranged between 4.92 and 4.63 Aluminium and Steel. The total acceptability score

Table 10. Average score of acceptability of roasted groundnut after third week storage.

Sr. No.	Methods/ Container	Conventionally roasted groundnut						Solar roasted groundnut					
		Colour	Odour	Taste	Texture	Overall acceptability	Total score	Colour	Odour	Taste	Texture	Overall acceptability	Total score
1.	Pearlpet	4.79	4.51	4.71	5.00	4.71	4.74	3.18	2.1	3.75	3.15	3.55	3.30
2.	Plastic opeque	4.73	4.81	4.74	4.78	4.78	4.76	3.81	2.68	3.60	3.18	3.32	3.33
3.	Aluminium	4.78	4.68	4.81	4.25	4.63	4.73	4.12	3.82	3.66	3.15	3.28	3.60
4.	Steel	4.80	4.58	5.00	4.96	4.92	4.85	4.16	3.74	3.7	3.12	3.44	3.63
5.	Glass	4.77	4.71	4.80	4.82	4.79	4.77	4.12	3.77	3.74	3.13	3.34	3.62
6.	Tin	4.81	4.71	4.84	4.80	4.70	4.03	4.15	3.70	3.71	3.12	3.39	3.61

was highest for Steel followed by Glass, Plastic opaque and Pearlpet and lowest in Tin.

Solar roasted groundnut did not achieve maximum score for any parameter in any container. Similar higher values were detailed for colour in all containers except plastic opaque (3.81), while Plastic opaque and Pearlpet had lower score for odour. The total acceptability score for taste, texture, overall acceptability and the total average acceptability score ranged between 3.75 and 3.66, 3.18, 3.12, 3.44, 3.28, 3.63, 3.3 respectively. The total acceptability score for all the containers was notable lower for the solar roasted product compared to these roasted conventionally. Maximum total acceptability score rated Steel first and Glass, Tin and Aluminium were next denoting slight variation and Plastic opaque and Pearlpet at lower level.

It is assumed that at the end of IIIrd week storage, conventionally roasted groundnuts has comparatively higher acceptability than solar roasted. It is also conveyed that Steel and Glass had better performance for storage of both types of roasted groundnut.

The data for acceptability of roasted groundnut at the end of the IVth week of storage is put fourth in the table 11.

The conventionally roasted groundnut denoted higher acceptability score for colour than odour in all the containers. Low score was reported in Glass and Tin containers. Comparatively Glass stored product had lower score for taste (3.82), texture (3.88) and overall acceptability (3.80).

The total score among selected containers declared pearlpet ranking Ist, revealing highest acceptability of product followed by Plastic opaque and Steel with compatible score and Glass the lowest, indicating least acceptability.

As viewed in solar roasted groundnut the maximum score ranged between 3.1 and 3.69 for colour in all containers and for overall acceptability in pearlpet, while all other parameters recieved lower figures with least for odour. Total acceptability score was maximum for Pearlpet and lowest for steel, other containers crept in between with almost similar scores.

It is percieved that solar roasted groundnut at the end of the IVth week had much low acceptability

Table 11. Average score of acceptability of roasted groundnut after fourth week storage.

Sr. No.	Methods/ Containers	Conventionally roasted groundnut						Solar roasted groundnut					
		Colour	Odour	Taste	Texture	Overall acceptibility	Total score	Colour	Odour	Taste	Texture	Overall acceptibility	Total score
1.	Pearlpet	4.33	3.40	4.15	4.21	4.21	4.6	3.69	2.08	2.53	2.70	3.1	2.82
2.	Plastic opaque	4.32	3.70	4.12	4.18	4.59	4.18	3.30	2.13	2.50	2.70	2.73	2.67
3.	Aluminium	4.31	3.74	4.02	4.21	4.02	4.08	3.60	1.95	2.64	2.66	2.46	2.66
4.	Steel	4.28	4.00	4.50	4.03	4.3	4.17	3.48	2.22	2.53	2.01	2.93	2.63
5.	Glass	4.25	3.34	3.82	3.88	3.80	3.66	3.66	1.90	2.53	2.68	2.77	2.70
6.	Tin	4.21	3.81	3.72	4.35	4.08	4.04	3.6 3.60	2.0	2.62	2.45	2.77	2.68

compared to conventional reasted. Considering the higher acceptability, Pearlpet was the most suitable for both the methods, followed by Plastic opaque and Steel in conventional Glass and Tin in solar roasting methods.

Table 12 describes the acceptability score at the end of the Vth week for roasted groundnut.

As revealed in table, the score for colour was much higher (3.96 - 3.82) compare to odour (2.67 - 1.25), taste (2.92 - 1.0) and texture (2.92 - 2.32) in conventionally roasted groundnut. The overall as well as total acceptability was highest in the product stored in steel followed by Pearlpet, declaring them Ist and IInd best in acceptability.

In solar roasted groundnut acceptability score for colour ranged between 3.51 and 3.18 while for odour and taste, values were much lower i.e. 1.77 - 1.13 and 1.24 and 1.4 respectively. Only Aluminium and Tin stored products denoted better values for texture (3.27 and 3.16) while the overall acceptability score was higher in Glass followed by Tin and Pearlpet. The maximum total acceptability score was only 2.41 implying

Table 12. Average score of acceptability of roasted groundnut after fifth week storage.

Sr. No.	Methods/ Containers	Conventionally roasted groundnut						Solar roasted groundnut					
		Colour	Odour	Taste	Texture	Overall acceptability	Total score	Colour	Odour	Taste	Texture	Overall acceptability	Total score
1.	Pearlpet	3.85	2.5	2.78	2.73	3.43	3.05	3.19	1.42	1.15	2.89	2.71	2.27
2.	Plastic opeque	3.91	1.25	1.21	2.33	2.1	2.16	3.51	1.13	1.24	2.34	2.27	2.09
3.	Aluminium	3.82	1.69	1.9	2.66	3.2	2.65	3.48	1.77	1.15	3.20	2.23	2.38
4.	Steel	3.96	2.67	2.92	2.96	3.59	3.22	3.18	1.72	1.4	2.24	2.63	2.23
5.	Glass	3.88	1.65	2.27	2.42	2.86	2.57	3.18	1.59	1.4	2.95	2.93	2.41
6.	Tin	3.88	2.45	1.95	2.46	2.26	2.6	3.18	1.27	1.21	3.16	2.76	2.31

lower acceptability in the product in Glass and least for plastic opaque (2.09).

It is infered that except Steel and pearlpet stored conventionally roasted groundnut, the acceptability of the products in all the containers in both the methods was much low, at the end of the 5 weeks, implying deterioration of the product. For conventional roasting, products in Steel and Pearlpet reported better acceptability, while Glass and Aluminium performed better for storage of solar roasted groundnut.

Table 13 represents average total acceptability score at the end of each week of experiment for conventional and solar roasted samplina.

As expressed, initially product reported maximum score. It was gradually decreasing with the increase in duration in all containers for both the methods. The reduction from the end of Ist to IIIrd week in conventionally roasted samolina was gradual with sudden variation in score in IVth and Vth week, denoting faster deterioration.

In solar the reduction was more obvious in the total acceptability average score from

Table 13. Weekwise average total acceptability score for roasted grou semolina stored in selected containers

Sr. No.	Methods/ Container	Conventional method							Solar method					
		Initial score	I week	II week	III week	IV week	V week	Total score	I week	II week	III week	IV week	V week	Total score
1.	Pearlpet	5	4.92	4.76	4.77	2.92	2.62	3.99	4.80	4.63	4.25	2.10	2.10	3.57
2.	Plastic opaque	5	4.89	4.72	4.74	2.98	2.98	4.06	4.80	4.58	3.80	2.09	2.09	3.47
3.	Aluminium	5	4.18	4.74	4.75	2.83	2.83	3.86	4.18	4.72	3.92	2.60	2.60	3.60
4.	Steel	5	4.94	4.74	4.82	3.35	3.35	4.24	4.78	4.60	4.16	2.70	2.70	3.78
5.	Glass	5	4.89	4.79	4.73	2.90	2.90	4.04	4.65	4.54	3.93	2.40	2.40	3.58
6.	Tin	5	4.92	4.72	4.76	3.07	3.07	4.10	4.84	4.66	3.73	2.39	2.39	3.60

IIIrd week onwards. Average total acceptability score at the end of experiment i.e. Vth week was lowest. Maximum and minimum average acceptability score reported 4.24 and 3.86 value for conventionally roasted samolina while in solar roasted it was much lower viz. 3.78 and 3.47 respectively. The average total acceptability score was highest for the product in Steel container in both the methods while Aluminium and Plastic opaque scored next best in conventional and solar roasted products respectively.

Table 14 narrates per week average total acceptability score for conventional and solar roasted groundnut in selected containers.

As evident, the initial score was maximum for both conventional and solar roasted products, which was decreasing with the advancing duration. The decrease was gradual upto IIIrd week with rapid fall in IVth week with further notable difference in Vth week in conventional method. On the other hand in solar roasting, the gradual decrease was observed only upto IInd week. The difference in score was more remarkable from the IIInd week end with much faster lowering in IVth

Table 14. Weekwise average total acceptaibility score for roasted groundnut stored in selected containers.

Sr. No.	Methods/ containers	Conventional methods							Solar method					
		Initial score	I week	II week	III week	IV week	V week	Total score	I week	II week	III week	IV week	V week	Total score
1.	Pearlpet	5	4.96	4.85	4.73	4.6	3.05	4.43	4.81	4.73	3.30	2.82	2.27	3.58
2.	Plastic opaque	5	4.90	4.84	4.76	4.18	2.16	4.16	4.82	4.77	3.33	2.67	2.09	3.53
3.	Aluminium	5	4.86	4.81	4.73	4.08	2.65	4.22	4.60	4.72	3.60	2.66	2.38	3.59
4.	Steel	5	4.96	4.89	4.85	4.17	3.22	4.41	4.83	4.80	3.63	2.63	2.23	3.62
5.	Glass	5	4.82	4.84	4.77	3.81	2.57	4.16	4.81	2.72	3.62	2.70	2.41	3.65
6.	Tin	5	4.89	4.87	4.03	4.04	2.60	4.08	4.82	2.82	3.61	2.68	2.31	3.64

and Vth week successively. The maximum score for average total acceptability in conventionally roasted groundnut was 4.43 and maximum 4.08, while in solar roasting much lower values such as 3.65 and 3.53 were obtained respectively. Highest average total acceptability was alloted for Pearlpet followed by Steel and lowest for Tin in conventional roasted groundnut while, in solar roasted product Glass was followed by Tin while Plastic opaque had least acceptable product.

Mean score of acceptability for colour, odour, texture and overall acceptability of samolina roasted by conventional method stored in different containers is presented in Table 15.

Statistically the scores obtained for odour of conventionally roasted samolina in different containers differed significantly. The product stored in Glass container had lowest mean score for odour, where as the score of Aluminium, Tin and Plastic opaque container were at par with each other. Pearlpet container was at par with Tin and Plastic opaque. Storage in Steel container proved the best.

Table No.15: Mean score of acceptability of samolina roasted by conventional method stored in different containers.

Sr. No.	Characters / Containers	Mean acceptability score				Overall acceptability
		Clour	odour	taste	texture	
1.	Pearlpet	4.62	4.27	4.31	4.46	4.37
2.	Plastic opeque	4.50	4.09	4.31	4.39	4.45
3.	Aluminium	4.51	3.94	4.27	4.41	4.43
4.	Steel	4.53	4.55	4.40	4.51	4.56
5.	Glass	4.54	3.61	4.30	4.28	4.44
6.	Tin	4.47	4.09	4.30	4.4	4.50
7.	F-value	0.6	9.2**	1.4	1.6	1.2
8.	S.E.	0.069	0.105	0.04	0.059	0.057
9.	C.D.	NS	0.296	NS	NS	NS

Mean score of acceptability for colour, odour taste, texture and overall acceptability of samolina roasted in solar cooker and stored in different containers is reported in table 16.

Statistical analysis proved highly significant difference in the scores obtained for the odour and texture of solar roasted samolina,

stored in different containers. Scores for odour in opaque plastic container was lowest among all other containers where as the scores for pearlpet, Aluminium, Steel, Glass and Tin were at par with each other.

Table 16: Mean score of samolina roasted by solar method stored in different containers.

Sr. No.	Characters / Containers	Mean acceptability score				Overall acceptability
		Colour	odour	taste	Texture	
1.	Pearlpet	3.92	3.77	3.37	3.88	3.84
2.	Plastic opaque	3.96	3.38	3.55	3.71	4.00
3.	Aluminium	4.05	3.64	3.46	3.74	3.83
4.	Steel	3.83	3.79	3.60	3.70	3.80
5.	Glass	4.00	3.77	3.43	3.65	3.71
6.	Tin	3.86	3.72	3.49	3.59	3.72
O.	F-value	0.7	6.5**	1.5	3.6**	1.1
C.	S.E.	0.099	0.061	0.068	0.052	0.1
C.	C.D.	NS	0.169	NS	0.144	NS

It was evident that acceptability of the texture of the stored samolina in Tin container scored least, though in Glass, Steel and Plastic

containers it was at par. Aluminium was the next better container, Pearlpet being the best of all for the acceptability score of texture for the stored samolina.

Table 17 is detailed with mean score of acceptability for colour, odour, taste, texture and overall acceptability of groundnut roasted by conventional method stored in different containers.

Table 17: Mean scores of acceptability of Groundnut roasted by conventional method and stored in different containers.

Sr. No.	Characters / Containers	Mean acceptability score				Overall acceptability
		Colour	Odour	Taste	Texture	
1.	Pearlpet	4.49	3.98	4.08	4.27	4.31
2.	Plastic opaque	4.53	3.91	4.08	4.24	4.35
3.	Aluminium	4.58	4.31	4.33	4.32	4.45
4.	Steel	4.53	4.07	4.29	4.26	4.24
5.	Glass	4.55	4.20	4.17	4.28	4.26
6.	Tin	4.11	3.59	3.87	3.94	3.96
7.	F-value	0.4	1.0	0.4	0.3	0.4
8.	S.E.	0.276	0.25	0.253	0.256	0.255
9.	C.D.	NS	NS	NS	NS	NS

As obsered statistically no significant difference was found in the scores obtained for different sensory characters for the groundnuts roasted by conventional method and stored in different containers.

Record of mean score of acceptability for colour, odour, taste, texture and overall acceptability of groundnut roasted by solar cooker method stored in different containers is given in Table 18.

Table 18: Mean score of acceptability of groundnut roasted in solar cooker and sotred in different containers.

Sr. No.	Characters / Containers	Mean acceptability score				Overall acceptability
		Colour	Odour	Taste	Texture	
1.	Pearlpet	4.16	3.27	3.39	3.68	3.69
2.	Plastic opaque	4.16	2.90	3.39	3.61	3.71
3.	Aluminium	4.23	3.39	3.42	3.63	3.47
4.	Steel	4.11	3.39	3.33	3.62	3.71
5.	Glass	4.22	3.44	3.38	3.57	3.53
6.	Tin	4.11	3.31	3.41	3.61	3.60
7.	F-value	0.9	6.4**	0.3	0.4	1.4
8.	S.E.	0.054	0.079	0.051	0.057	0.087
9.	C.D.	N.S.	0.223	N.S.	N.S.	N.S.

Statistically highly significant difference in the scores was obtained for odour of solar roasted groundnut stored in different containers. Odour of groundnut in opaque plastic container had significantly lowest score over all other containers where the Pearlpet, Aluminium, Steel, Glass and Tin containers was at par with each other.

Table 19 denotes mean score of total acceptability for colour, odour, taste texture and overall acceptability of samolina and groundnut computed at intervals during storage by both the methods.

Statistically significant difference was found for the overall acceptability score obtained for both the products roasted by conventional and solar cooking method and stored for selected durations.

Conventionally roasted groundnut depicted the least overall acceptability score in Vth week. The score at IVth week end was significantly higher than Vth week end and at par with IInd and IIIrd week end. Overall acceptability score in Ist week end by conventionally roasted groundnut was significantly higher than the other duration.

Table 19: Mean score of total acceptability of of samolina and groundnut roasted by two methods stored for selected period.

Duration in week	Mean acceptability score			
	Conventional method		Solar cooking method	
	Samolina	Groundnut	Samolina	Groundnut
1	4.77	4.86	4.74	4.80
2	4.54	4.79	4.68	4.69
3	4.49	4.78	4.01	3.50
4	3.77	4.13	2.68	2.687
5	3.05	2.67	2.32	2.08
F-value	8.9**	12.9**	41.9**	31.8**
S.E.	0.23	0.25	0.17	0.15
C.D.	0.66	0.73	0.49	0.48

Same statistically trend was observed for the overall acceptability score of conventionally roasted samolina. The score in last week end was significantly lower than first 4 weeks. Fourth week score for product was significantly higher than Vth. While Second, IIIrd, Ist week scores were at par and significantly higher than IVth week.

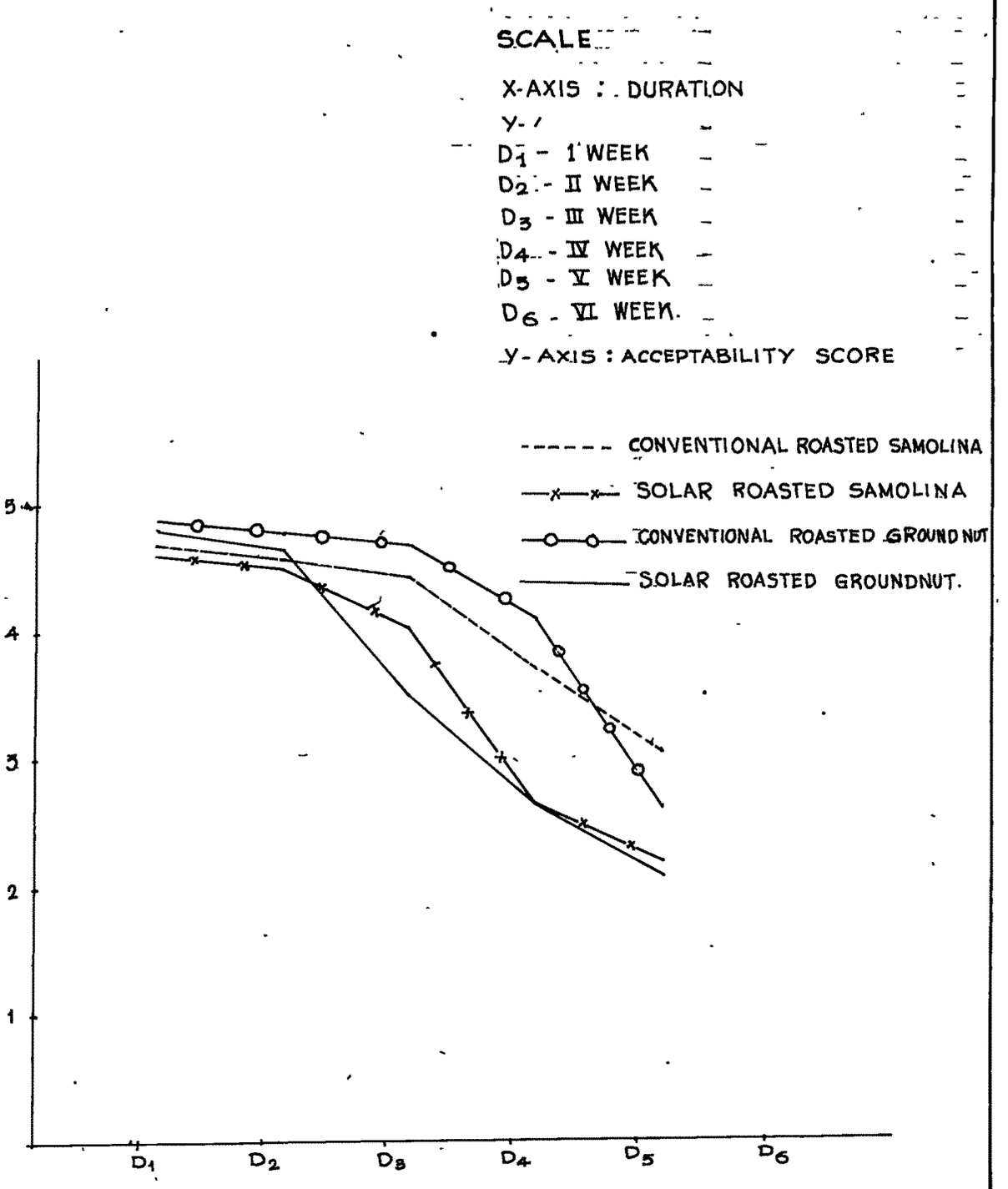

FIG. : ACCEPTABILITY OF SELECTED PRODUCTS AT SELECTED INTERVALS DURING STORAGE

4.3 Relation between storage containers, storage period, roasting method and acceptability:

Result of the Factorial Randomized Design applied to determine the relationship among selected factors is denoted in the following tables.

Table 20 statistically no significant difference was found in the overall acceptability scores of samolina roasted by conventional and solar method and stored in different containers to different period.

Table 21 Statistically the significant difference was observed for the overall acceptability score of conventionally roasted groundnut stored in different containers for different periods. Tin container had significantly lower mean value for the overall acceptability of the conventionally roasted groundnut. On the other hand mean score for plastic opaque, Pearlpet, Glass, Aluminium and steel were at par with each other and significantly higher than Tin, Aluminium and Steel recorded identical mean and claimed significantly higher for the acceptability. Duration wise it was observed that significantly lower acceptability score was in Vth week IV week

Table 20: Relation between acceptability, storage period, containers and method of Roasting.

	(Conventional method) Samolina						(Solar method) Samolina					
Duration / Containers	I	II	III	IV	V	Mean	I	II	III	IV	V	Mean
Pearlpet	4.96	4.72	4.67	4.64	3.56	4.51	4.92	4.84	4.80	2.92	2.85	2.06
Plastic opaque	4.84	4.85	4.89	3.44	3.35	4.27	4.72	4.78	4.60	3.94	2.89	4.18
Aluminium	4.80	4.58	4.24	3.77	3.77	4.23	4.85	4.70	4.65	3.10	3.75	4.21
Steel	4.88	4.61	4.45	3.94	4.93	4.56	4.78	4.78	4.78	3.03	3.89	4.25
Glass	4.78	4.38	4.23	3.62	3.56	4.11	4.85	4.80	4.45	3.20	3.15	4.09
Tin	4.88	4.43	4.28	3.63	3.63	4.17	4.84	4.70	4.15	3.99	2.94	4.12
Mean	4.85	4.59	4.46	3.84	3.8		4.82	4.76	4.57	3.36	3.24	

$F - 5, 20 = 2 \cdot 40$

F = 0.613 N.S.

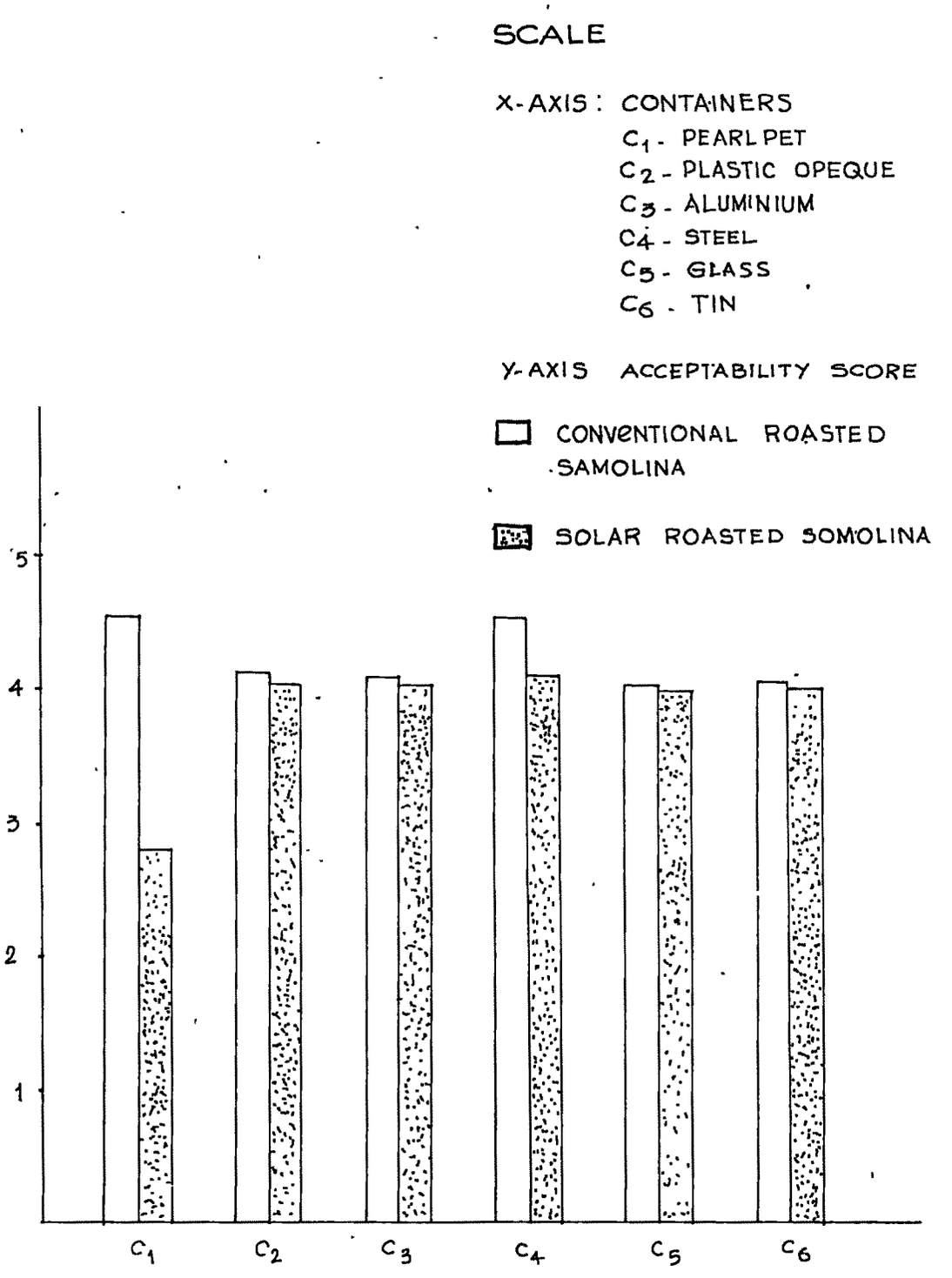

FIG. : ACCEPTABILITY OF SELECTED FOOD MATERIALS ROASTED BY CONVENTIONAL & SOLAR METHOD AT SELECTED INTERVALS DURING STORAGE

Table 21: Relation between acceptability, storage period, containers and method of Roasting.

	(Conventional method) Groundnut						(Solar method) Groundnut					
Duration in week / Container	I	II	III	IV	V	MEAN	I	II	III	IV	V	Mean
Pearlpet	5	5	4.83	4.22	3.25	4.46	4.96	4.94	4.72	3.95	3.65	4.44
Plastic opaque	4.98	4.90	4.80	4.31	2.77	4.35	4.99	4.96	4.81	4.52	2.32	4.32
Aluminium	4.96	4.93	4.91	4.46	3.41	4.53	4.96	4.93	4.73	4.51	3.33	4.50
Steel	4.96	4.80	4.77	4.21	3.93	4.53	4.96	4.97	4.98	3.83	3.78	4.50
Glass	4.97	4.96	4.76	4.18	3.74	4.52	4.96	4.85	4.68	3.87	3.77	4.42
Tin	4.86	4.85	4.67	3.92	2.70	4.2	4.99	4.82	4.68	4.38	3.45	4.46
	F = 3.87*						F = 6.95**					

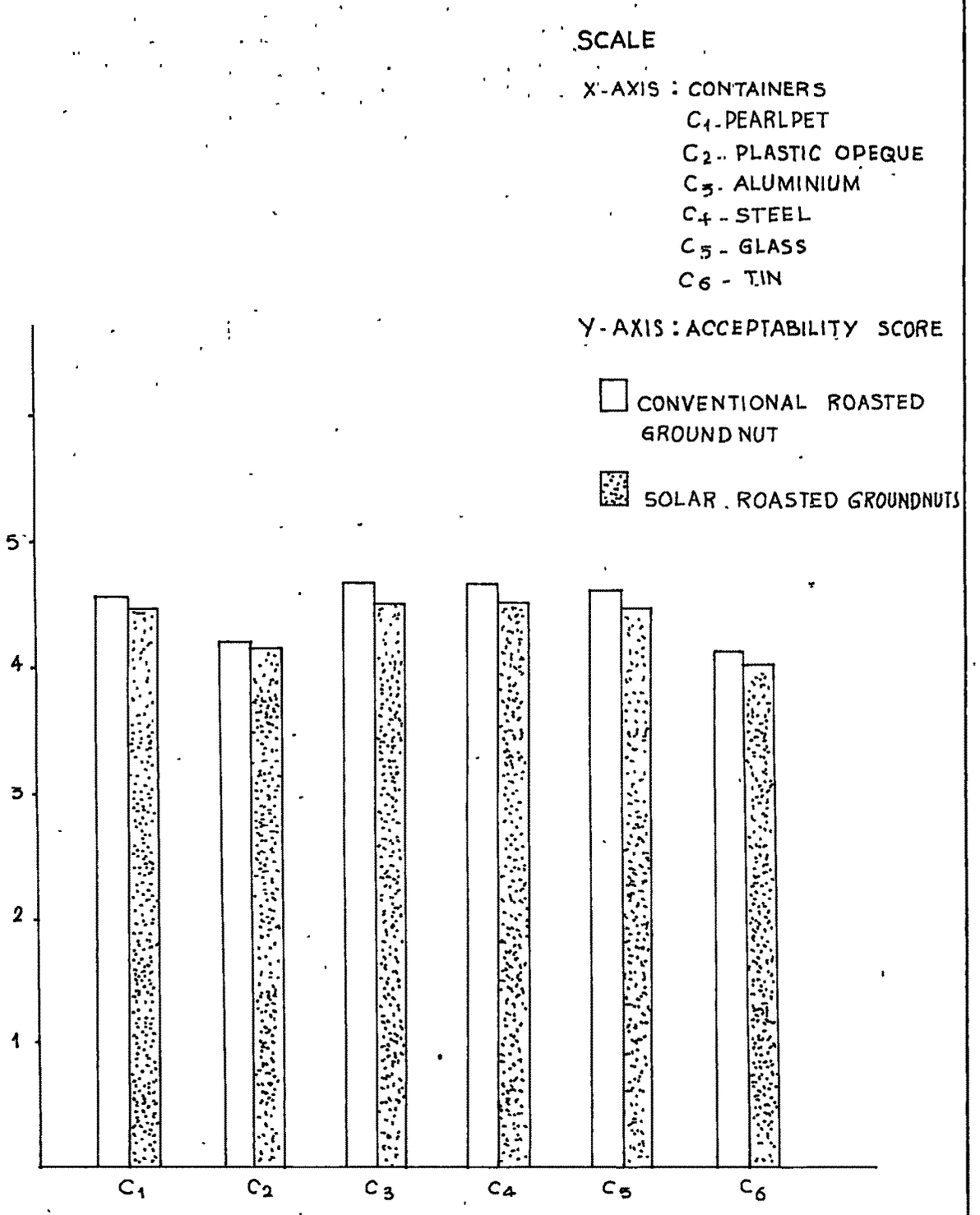

FIG. : ACCEPTABILITY OF SELECTED FOOD MATERIALS ROASTED BY CONVENTIONAL & SOLAR METHOD AT SELECTED INTERVALS DURING STORAGE (GROUND NUT)

higher than Vth and score in III was higher than IVth week. The score in Ist and IInd week of duration were at par with each other. It is explained that with increase in storage duration, the overall acceptability score was decreasing from 3rd week onwards, with lowest score in the 5th week i.e. at end of termination of experiment. It was observed that there was significant difference in overall acceptability score for solar roasted groundnut stored in different containers for different periods. The overall acceptability score for the stored product showed that the containers were at par with each other, where as the overall acceptability score in different period indicated that the overall acceptability score in last week was significantly lower than the IVth week which was also significantly lower than IIIrd week. The score in IInd and Ist week were at par with each other but significantly higher than IIIrd, IVth and Vth duration.

It is summarized from the above discussion that acceptability of samolina and groundnut was decreasing gradually with increase in storage period. The deterioration was more remarkable after the

IIIrd week of duration. Roasted product did not show development of insects. Moisture content in the product change due to humidity and atmospheric temperature.

Steel container was best for storing both types of Roasted products giving higher acceptability.

CHAPTER-V

SUMMARY

SUMMARY

The investigation titled "Shelf life and acceptability of selected food materials roasted by conventional and solar cooking method and stored in selected household containers", was executed with following objectives.

1. To study the shelf life of the selected food materials roasted by conventional and solar methods, and stored in selected household containers for given period.
2. To find out the acceptability of selected food materials roasted by conventional and solar cooking, and stored in selected household containers for selected period.
3. Relation between storage containers, storage period, roasting methods and acceptability.

The materials used for the study included samolina and groundnut which were collected from local market. Glass, Tin, Aluminium, opaque Plastic and transparent plastic pearlpet were the containers selected for storage. Roasting procedure for conventional and solar cooking were standardized for both samolina and groundnut. The satandardized

procedure was used for final experiment. A score card was developed using five point scale for assessing acceptability and panel of 10 members were selected by applying threshold test. Experiment was initiated by storing 500 grams each of by conventional and solar roasted samolina and groundnut in selected containers in three replications. During the 5 weeks storage observation at weekly intervals were recorded for moisture development, insect development and acceptability.

The results of the study are summarized under.

5.1 Shelf life:

5.2 Moisture development:

1. The initial moisture of conventionally and solar roasted samolina and groundnut increased gradually upto end of IVth week of storage in all containers.
2. At the end of Vth week the moisture content had reduced.

5.3 Insect development:

1. Emergence of insects was not observed during the 5 weeks storage period in samolina and groundnut.

2. The groundnut did not show any damage on or within, confirming absence of insects development.

5.4 Acceptability:

1. The higher acceptability was observed for conventional roasted products than solar roasted.
2. With increase in storage period the acceptability of the conventional and solar roasted products was lowering.
3. Comparatively conventional and solar roasted samolina had better score throughout the storage period than conventional and solar roasted groundnut.
4. The solar roasted groundnut denoted deterioration from IIIrd week end.
5. Comparatively more deterioration was observed in solar roasted groundnut.
6. Acceptability of the samolina roasted by conventional method stored in steel container proved the best.
7. The average total acceptability score was highest for the groundnut stored in steel

container in conventional and solar method at the end of V week of storage.

8. The overall acceptability score of conventionally roasted samolina was higher at first 4 weeks.

9. Statistically the scores obtained for odour of conventionally roasted samolina in different containers differed statistically.

10. Statistically analysis proved highly significant difference in the scores obtained for the odour and texture of solar roasted samolina, stored in different containers.

11. As observed statistically no significant difference was found in the scores obtained for different sensory characters for the groundnuts roasted by conventional method and stored in different containers.

12. Statistically highly significance difference in the scores was obtained for odour of solar roasted groundnut stored in different containers.

5.6 Relation between storage containers, storage period, roasting methods and acceptability:

1. Statistically no significant difference was found in the overall acceptability scores of samolina roasted by conventional and solar method and stored in different containers to different period.

2. Statistically the significant difference was observed for the overall acceptability score of conventionally roasted groundnut stored in different containers for different periods.

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LITERATURE CITED

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APPENDIX

Appendix - I

NAME: FOLLOWING FOODSTUFFS ARE GIVEN FOR SENSORY EVALUATION, PANEL MEMBERS ARE REQUISTED TO GUIDE THE FOLLOWING PRODUCTS BY USING FOLLOWING.

EXCELLENT	V.GOOD.	GOOD	FAIR	POOR
5	4	3	2	1

Sr.	Name of the Foodstrfs.	Colour	odour	Taste	Texture	Rancietity	Overall acceptabi-lity	Remarks
1.	A							
2.	B							
3.	C							
4.	D							
5.	E							
6.	F							

S.No.	Colour	Odour	Taste	Texture	Rancietity	Overall accepta-bility	Remarks
1.	Very desirable =E=5	Excellent =5	Excellent =5	Very crispy =E=5	NIL =E=5	Excellent =5	
2.	Desirable V.G.=4	Very Good =4	V.Good=4	Crispy =V.G.=4	Weak=V.G. =4	Very Good =4	
3.	Acceptable =G=3	Good =3	Good=3	Fairly Cripsy=C 3	Moderate= C=3	Good = 3	
4.	Slightly accepta-	Fair=2	Fair=2	Slightly soggy=F =2	Strong=F=2	Fair = 2	
5.	Undesirable=P=1	Poor=1	Poor=1	Very soggy=P=1	Very Strong=P=1	Poor = 1	

SIGNATURE

Appendix-2

Score card

Name of the person.

Date.

Please taste the following samples and indicate the result by ( ) mark in appropriate colomn shown.

Test I

Sample	Score					
	Plain	very weak	weak	Medium	strong	very strong
A						
B						
C						
D						
E						
F						

Test II

Sample	Score					
	Plain	very weak	weak	medium	strong	very strong
A						
B						
C						
D						
E						
F						