

Study on Effect of Pretreatments and Microwave Drying On Banana Chips

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Abstract: The study was conducted to evaluate the effect of pre-treatments (Control sample, Hot waterblanched sample and Citric acid blanched sample), power of microwave oven (40W, 60W and 80W) and time on banana chips. To evaluate the effect of above mentioned parameters, chemical evaluation such as moisture content, fat content and ash content were carried out. Physical parameter such as blemish count was undertaken. Shrinkage in diameter and thickness of banana chips with respect to time of drying and power of microwave oven was also studied. Sensory analysis for colour, taste, texture, flavour, appearance and overall acceptability was carried out according to the 9 point hedonic scale.

The results showed that, the moisture loss from banana chips increased with increase in power of microwave oven and time of drying. More fat was lost with increase in power of microwave oven. Citric acid blanched sample showed more fat loss. There was no particular pattern for ash content found for any of the above mentioned treatments. The shrinkage of diameter and thickness of banana chips increased with increase in power of microwave oven and time of drying. Blemishes in banana chips increased with the increase in power of microwave oven. According to the overall sensory scores; banana chips prepared at 60W of microwave power and by hot water blanched pre-treatment was the favorite among the panelists.

Key words: pre-treatments, microwave oven power.

I. Introduction

Banana (*Musa paradisiaca L.*) is the common name for herbaceous plants of the genus *Musa* and for the fruit they produce. Today; they are cultivated throughout the tropics. They are grown in at least 107 countries, primarily for their fruit, and to a lesser extent to make fiber and as ornamental plants. Many varieties of bananas are perennial (Wikipedia.com). Banana is the second largest produced fruit after citrus, contributing about 16% of the world's total fruit production. India leads in production of banana in the world with 28.2 metric tonnes of banana production per year. Cavendish' bananas are the main commercial cultivar. Banana is very perishable fruit. To avoid the losses and wastage of banana it can be dried or dehydrated to increase the shelf life of fruit. Drying brings about a substantial reduction in weight and volume; thereby minimizing packaging, storage and transportation cost and also enable storability of the product under ambient temperature especially in developing countries. Dried fruits are unique, tasty and nutritious. They are easy to handle and can be easily incorporated during food formulation and preparation. Dried fruit can be eaten as a snack or added to cereals, muffins or ice cream. Dehydrated banana fruit is used as a staple or important food in many parts of the world and also used in various food preparations.

II. Materials And Methods

Sample Preparation

Bananas were procured from local market of Allahabad; the selections of banana were unripe so as to get the best results. Samples were peeled, sliced into 2.5 cm diameter and 3 mm thickness.

Pre-Treatments

Control (Unblanched)

The banana chips were dehydrated without any treatment.

Blanching

The banana chips were blanched in hot water at 80°C for 1 minute to avoid loss of product firmness..

Citric Acid Blanching

This treatment consisted of blanching the banana chips in 5% citric acid solution at 80°C for 1 minute.

Drying

In case of Household Microwave Oven, the banana chips were exposed to powers of 40W, 60W and 80W, until the moisture content fell below 3% (w.b).

Chemical Evaluation of Dried Banana Chips

Moisture content: The moisture content of the banana sample was determined gravimetrically by drying the sample at 105°C until a constant weight was obtained. The result was expressed as percent moisture loss (wet basis).

Crude fat: Soxhlet extraction method was used.

Ash content: Banana sample (2 g) was weighed into a crucible and placed in a muffle furnace at 550°C for 3 - 5h until a whitish substance was obtained. Weight of ash was expressed as a percentage of the initial sample weight.

Physical estimation of dried banana chips:

Chips Thickness and Diameter:

The change in chip thickness and chip diameter of pre-treated banana chips on drying at different microwave powers and time were measured by screw gauge and vernier calliper respectively. This practice was repeated thrice to get a mean value and results which were recorded in mm as for thickness and in cm for diameter.

Blemish Count:

It is used to assess the appearance of the final product. Procedure:

Rehydrate 50 g representative sample of the dehydrated material. Visually count the number of surface blemishes. Multiply the number of blemishes by 2 and report the number of blemishes per 100 g of sample.

Sensory Evaluation:

Sensory analysis is a necessary part of product estimation as it gives an overview of the acceptance of product by customer. The sensory analysis was carried out with parameters undertaken as Colour, Taste, Flavour, Texture, Appearance and Overall acceptability. Sensory analysis was carried according to the 9 point hedonic scale.

Statistical Analysis:

The analysis were conducted by adopting Full factorial design, two level and three level, the data recorded during the course of research were statistically analyzed by the "Analysis of Variance". The significant effect of treatment was judged with the help of "F" (Variance ratio). Calculated F value was compared with the table value of F prob at 5 % level of significance. If calculated value exceeded the table value, the effect was considered as significant. The significance of the study was tested at 5% level

III. Results And Discussions

Effect of treatments on moisture content of banana chips.

The mean scores for moisture content of banana chips dried with different treatments varied from 0.87 to 3.47. There was increase in moisture loss from banana chips with increase in microwave power and time of drying, this may be due to increase in conversion of water molecules into vapour with increase in power density and time of drying in microwave oven. Fig "1" shows the bar graph of moisture content of banana chips. The ANOVA showed significant effect of treatments on moisture content of banana chips at 5% level of significance.

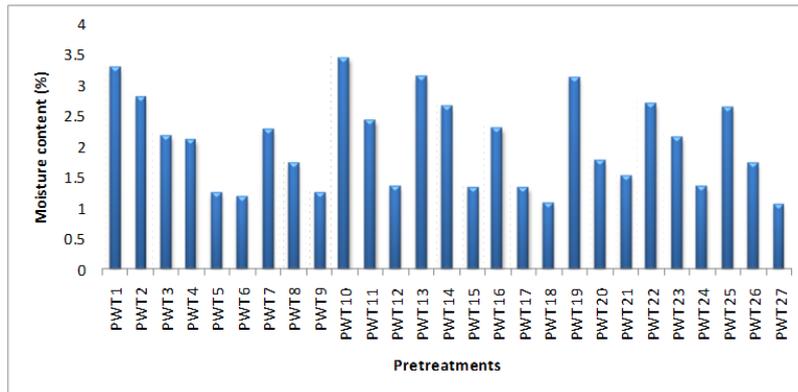


Fig 1: Moisture content of banana chipsEffect of microwave power and pre-treatments on Fat content of banana chips.

The fat content in dried banana chips varied from 1.42% to 2.19 % with different treatments. The highest value of fat content (2.19%) was for control sample dried at 40 W of microwave power and the lowest value (1.42%) was for the citric acid blanched sample dried at microwave power of 80W. The fat loss increased from control sample to hot water blanched sample to citric acid blanched sample which showed most fat loss. Similarly, with increase in microwave power there was increase in fat loss from banana chips with samples dried at 80 W resulting in most fat loss Fig “2” shows the effect of microwave power and pre-treatment on fat loss of banana chips. The ANOVA showed significant effect of treatments on moisture content of banana chips at 5% level of significance.

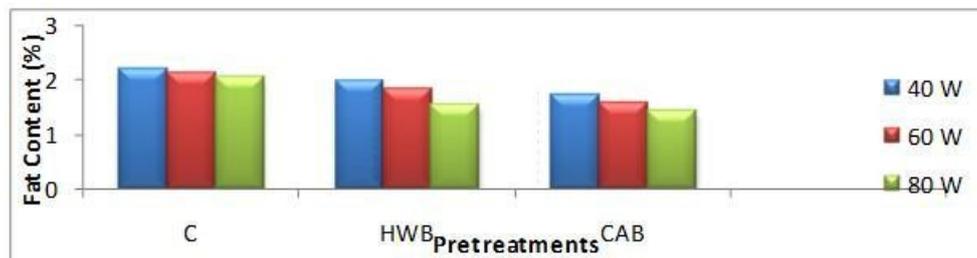


Fig 2: Effect of microwave power and pre-treatments on Fat content of banana chips

Effect of Microwave power and pre-treatments on Ash content of banana chips

The ash content of banana chips dried in microwave oven with different treatments varied from 0.81% to 0.87%. There was no particular result obtained which would have verified the effective treatment resulting in changes in ash content of banana chips. The result obtained was similar to that obtained by Adeyemi O.S. Fig.3 shows the ash content of banana chips. The ANOVA showed significant effect of treatments on moisture content of banana chips at 5% level of significance.

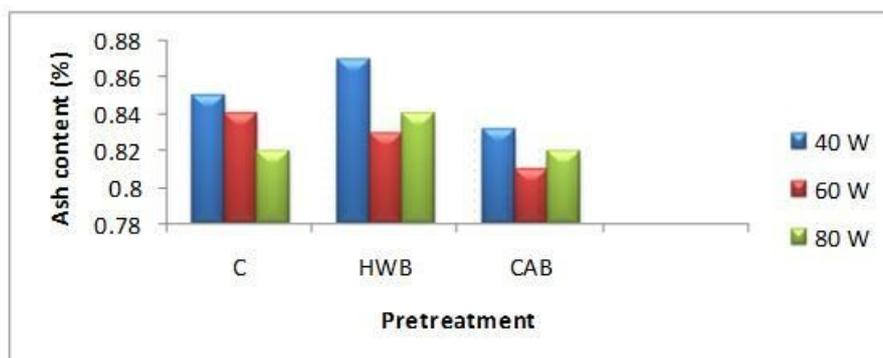


Fig 3 : Effect of Microwave power and pre-treatments on Ash content of banana chips

Shrinkage in pre-treated banana chips diameter dried at different microwave power and time.

The initial slice diameter was kept to be 2.5 cm. At 40 W, the shrinkage of diameter for control sample was 2.4 cm, 2.3 cm and 2.2 cm for 1 minute, 2 minutes and 3 minutes respectively. For HWB sample, the

diameter shrinkage at 40 W was 2.3 cm, 2.3cm and 2.2 cm for 1 minute, 2 minute and 3 minutes respectively. For CAB sample, at 40W the diameter shrinkage was to 2.4 cm, 2.3 cm and 2.2 cm for 1 minute, 2 minutes and 3 minutes respectively. At 60W, the shrinkage of diameter for control sample was 2.4 cm, 2.2 cm and 1.9 cm for 1 minute, 2 minutes and 3 minutes respectively. For HWB sample, the diameter shrinkage at 60W was 2.4 cm, 2.2cm and 2.0 cm for 1 minute, 2 minute and 3 minutes respectively. For CAB sample, at 60W the diameter shrinkage was to 2.4 cm, 2.1 cm and 2.1 cm for 1 minute, 2 minutes and 3 minutes respectively. At 80W, the shrinkage of diameter for control sample was 2.3 cm, 2.1 cm and 1.8 cm for 1 minute, 2 minutes and 3 minutes respectively. For HWB sample, the diameter shrinkage at 80W was 2.2 cm, 1.9 cm and 1.8 cm for 1 minute, 2 minute and 3 minutes respectively. For CAB sample, at 80W the diameter shrinkage was to 2.0 cm, 1.9 cm and 1.8 cm for 1 minute, 2 minutes and 3 minutes respectively. The results indicated that there was increase in shrinkage of diameter with increase in microwave power and time of drying. The ANOVA showed significant effect of treatments on moisture content of banana chips at 5% level of significance.

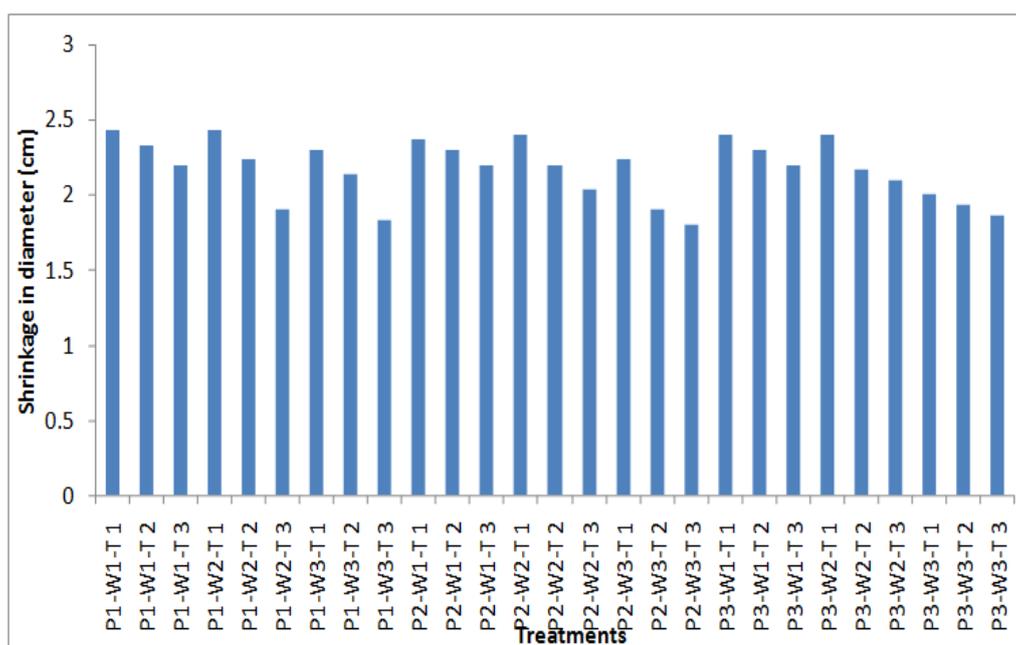


Fig 4: Shrinkage in pre-treated banana chips diameter dried at different microwave power and time.

The initial slice thickness was kept to be 3.0 mm. At 40 W, the shrinkage of thickness for control sample was 2.8 mm, 2.7 mm and 2.6 mm for 1 minute, 2 minutes and 3 minutes respectively. For HWB sample, the thickness shrinkage at 40 W was 3 mm, 2.7 mm and 2.5 mm for 1 minute, 2 minute and 3 minutes respectively. For CAB sample, at 40W the thickness shrinkage was to 2.9 mm, 2.8 mm and 2.6 mm for 1 minute, 2 minutes and 3 minutes respectively. At 60W, the shrinkage of thickness for control sample was 2.9 mm, 2.7 mm and 2.5 mm for 1 minute, 2 minutes and 3 minutes respectively. For HWB sample, the thickness shrinkage at 60W was 2.8 mm, 2.7 mm and 2.5 mm for 1 minute, 2 minute and 3 minutes respectively. For CAB sample, at 60W the thickness shrinkage was to 2.9 mm, 2.7 mm and 2.5 mm for 1 minute, 2 minutes and 3 minutes respectively. At 80W, the shrinkage of thickness for control sample was 2.8 mm, 2.6 mm and 2.3 mm for 1 minute, 2 minutes and 3 minutes respectively. For HWB sample, the thickness shrinkage at 80W was 2.6 mm, 2.4 mm and 2.1mm for 1 minute, 2 minute and 3 minutes respectively. For CAB sample, at 80W the thickness shrinkage was to 2.8 mm, 2.3 mm and 2.0 mm for 1 minute, 2 minutes and 3 minutes respectively. The results indicated that there was increase in shrinkage of diameter with increase in microwave power and time of drying. The ANOVA showed significant effect of treatments on moisture content of banana chips at 5% level of significance.

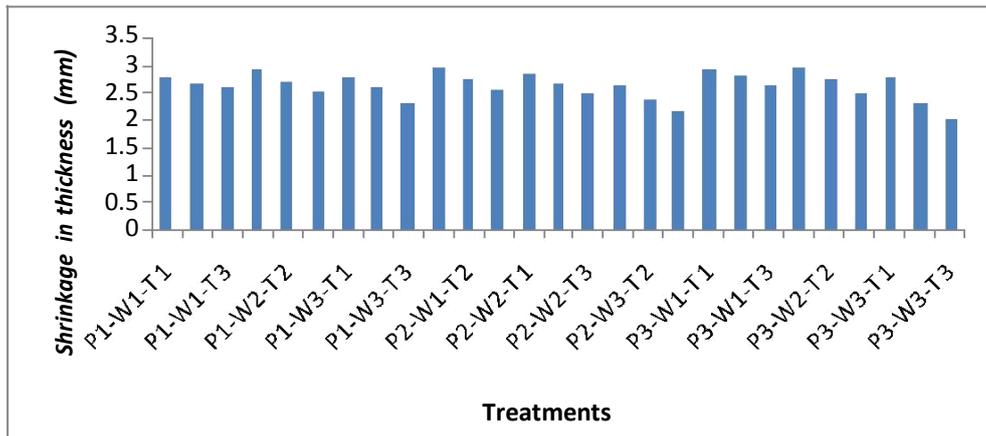


Fig 5: Shrinkage in pre-treated banana chips thickness dried at different microwave power and time.

Blemish Count:

Table 4.10 shows the mean score of blemish counts on banana chips. The results indicated that there was increase in blemishes in banana chips with increase in power of microwave oven. With respect to pre-treatments, there was no significant variation in blemishes on banana chips. Fig 5 shows the blemish count on the banana samples

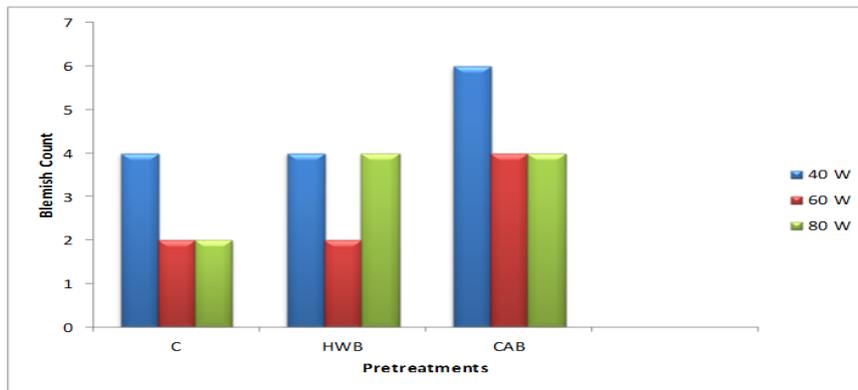


Fig 6: Effect of microwave power and pre- treatments on Blemish count in banana chips

Sensory Evaluation

According to the overall sensory scores, hot water blanched sample dried at 60 W of microwave power was the favourite for colour, taste, texture, flavor and overall acceptability.

For Appearance, banana chips prepared at 60 W with control (unblanched) pre- treatment was the favourite among the panelists. Even though the sensory scores for all the banana chips sample were ideal, the sample prepared at 60 W by hot water blanched pre-treatment was more optimum than the others in preparation of banana chips using microwave drying.

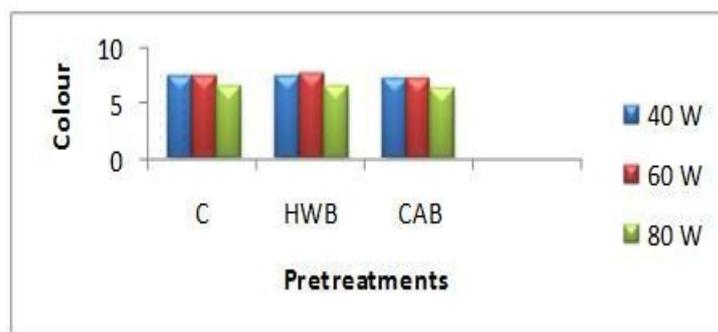


Fig 7: Effect of pre-treatment and microwave power on sensory score of colour of banana chips.

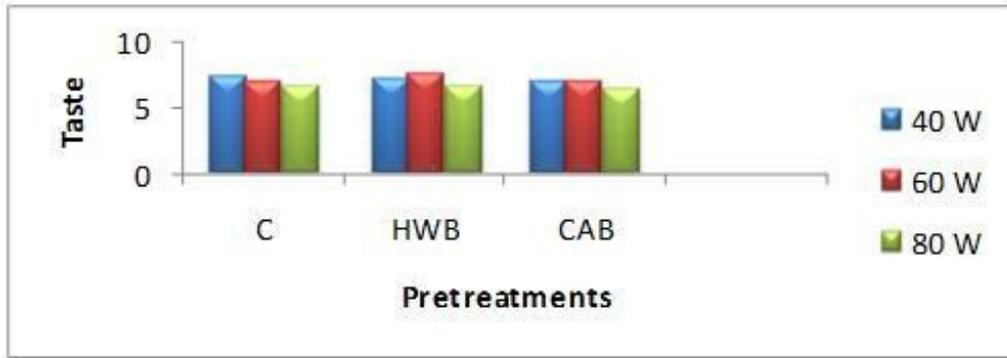


Fig 8: Effect of pre-treatments and microwave power on sensory score of taste of banana chips.

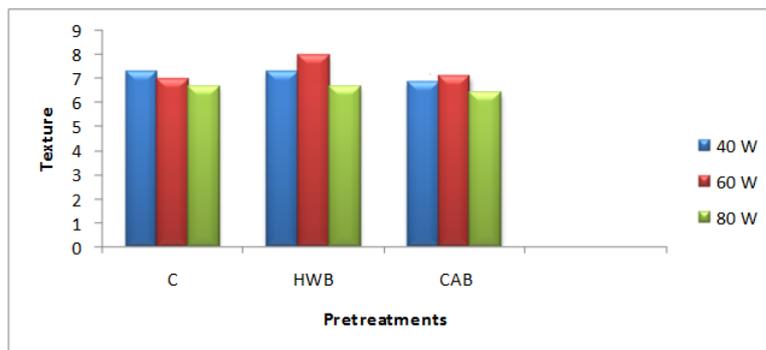


Fig 9: Effects of pre-treatments and microwave power on sensory score of texture of banana chips

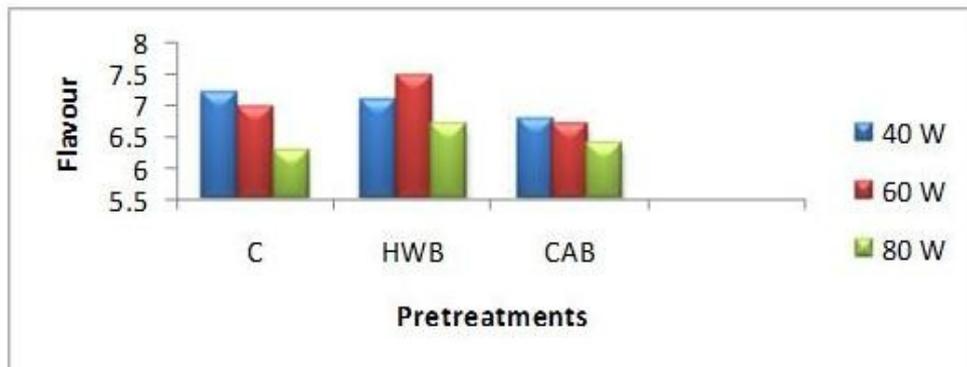


Fig 10: Effect of pre-treatments and microwave power on sensory score of flavour of banana chips

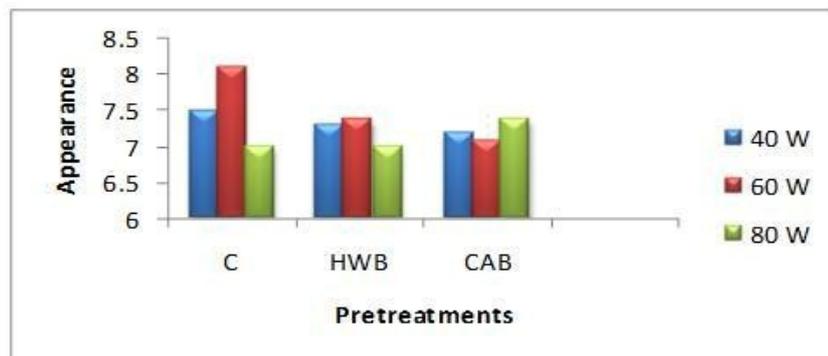


Fig 11: Effect of pre-treatments and microwave power on sensory score of appearance of banana chips

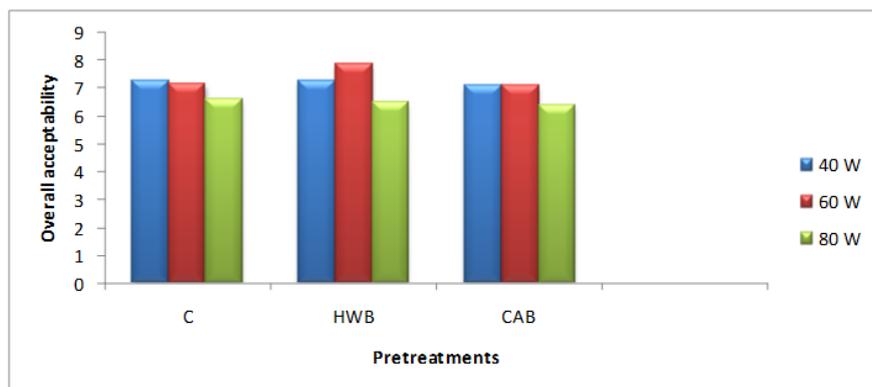


Fig 12: Effect of pre-treatments and microwave power on sensory score of overall acceptability Of banana chips

IV. Conclusion

From the study it was concluded that, the moisture content is influenced by the power of microwave oven and the time chips took for drying. The fat content decreased with increase in microwave power. Ash content was not influenced by any of the treatments during microwave oven drying. Shrinkage increased with increase in microwave power and time of drying. The hot water blanched sample dried at 60 W microwave powers was the most accepted sample of banana chips with response to sensory scores.

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