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Research Paper :

Effect of different pretreatments of the sensory quality and drying kinetics of fig (*Ficus carica* L.) fruits

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ABSTRACT

In the present investigation attempt has been made to evaluate the effect of different drying pretreatments on the sensory qualities of dried fig fruits and on drying kinetics. Three drying pretreatments *viz.*, Blanching + KMS dip, Blanching + ammonium carbonate dip and ammonium carbonate + KMS dip. The pretreated fig fruits were then dried in convective type cabinet drier at 60±5 ^{0}C temperature till the moisture content reduced to 20 per cent predetermined level. It was observed that the fig fruits pretreated with blanching + KMS dip were best in sensorial quality parameters followed by those pretreated with ammonium carbonate + KMS dip. The pretreatments also showed drastic reduction in drying time of fig fruits.

Key words : Fig fruits, Pretreatments, Cabinet drying, Sensory quality

The fig is a moderately important world crop, with an estimated annual production of 1,077,211 tons of fruits (FAO, 2003). The biggest fig producer is Turkey and has approximately 23.50 % of the total production of the world and about 51.60 % of this crop is sold as dried fruit (Ibrahim, 2005).

Figs have a great importance in nutrition due to being important source of carbohydrates. They contain essential amino acids and are rich in vitamins A, B_1, B_2 and C and minerals. Fresh figs are very sensitive to microbial spoilage, even in cold storage conditions; thus they must be preserved in some way (Sandhu, 1990).

Fig, one of the earliest cultivated fruit, is the most important dried product with several varieties (*Ficus carica* is one of them) dried and stored for later consumption (Vinson, 1999).

Drying of fruits and vegetables is one of the oldest forms of food preservation methods known to man and is the most important process for preserving food since it has great effect on the quality of dried product. Also it brings about substantial reduction in weight and volume, minimizing packaging, storage and transportation costs (Okos *et al.*, 1992).

The drying of whole fruits with hot, dry air poses problems about the use of optimal air water mixtures, especially if the fruits are rich in sugars. Hot, very dry air can remove water from fruits faster than the fruit can allow, because fruit peel is, in general, barrier to water vapor passage. When this occurs, fruits tend to swell and liquid leakage results in the penduncular area or from the peel cracks. Fruits rich in sugar, moreover, may undergo hardening of the surface layers (case hardening), because of sugar movement from flesh to peel. Some technological strategies can solve these problems *viz.*, use of pretreatments such as blanching, which causes microwounds on the peel and chemical treatments, which removes waxy layer, thus enhancing water evaporation from fruits.

Materials:

Fig fruits:

The good quality fresh fig fruits of Deanna variety were procured from the Farmer's field.

Chemicals:

The different chemical such as potassium metabisulphite (KMS), ammonium bicarbonate, etc. were made available from the Laboratory.

Equipments:

Cabinet dryer mounted in the pilot plant of college was utilized for this project.

METHODOLOGY

Pretreatments:

Blanching and sulphitation:

The blanching of fresh fig fruits was carried out in water at 80^{0}C temperature for 4 minutes. The ratio of fruit to blanching water was maintained as 1:5. The blanched fruits were then dipped in 1 per cent potassium metabisulphite (KMS) solution for 30 minutes. The treatment was coded as T_1.

Blanching and ammonium carbonate:

The fresh fig fruits were blanched and then dipped in 2.4 per cent solution of ammonium carbonate for 30 min. The treatment was coded as T_2.

Sulphitation and ammonium carbonate:

The sulphitation of fruits was done by dipping them in 1 per cent solution of KMS for 30 minutes and again they were separately dipped in 2.4 per cent solution of ammonium carbonate. The temperature of both the solution was kept at 50^0C.This treatment was coded as T_3.

Drying:

The pre-treated fig fruits were spread uniformly and separately on the trays and drying was carried out at 60 ± 5^0C in a cabinet drier till their moisture content falls down to 20 per cent. The control sample was also dried at the same condition without giving any pretreatment.

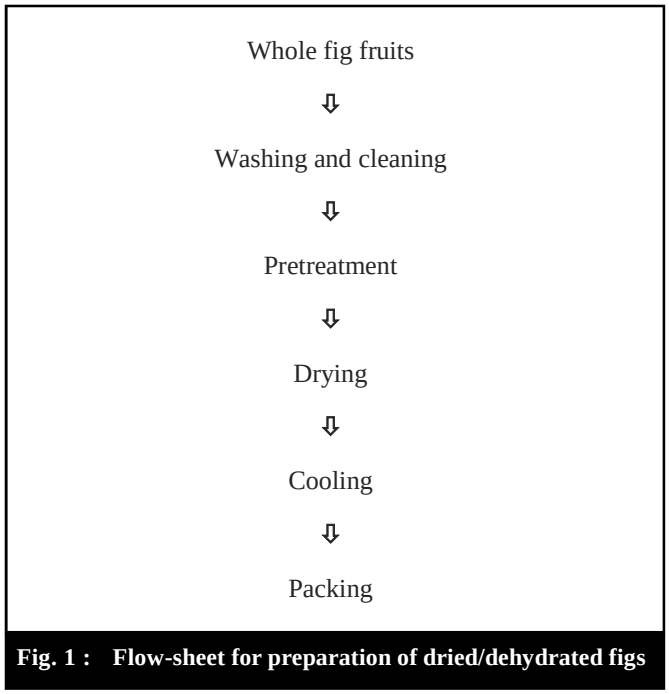

Fig. 1 : Flow-sheet for preparation of dried/dehydrated figs

Sensory evaluation:

The dried fig fruits were subjected sensory evaluation by using semi-trained panel members on the 9 – point Hedonic Rating Scale as described by Ranganna (1995).

Drying kinetics:

The loss in moisture content of fig fruits during cabinet drying was assessed at every 5 hour regular interval. The fruits were dried at predetermined moisture level of 20 per cent. The data obtained as moisture content of fruits at regular time interval was plotted and the drying kinetics were reported.

RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Effect of different pre-treatments on the sensory quality of dried figs:

The dried figs were evaluated for their sensorial quality parameters. The mean score values of sensory analysis of dried figs are depicted in Table 1.

Colour and appearance:

It was evident from Table 1 that the pre-treatments have affected the colour and appearance characteristic of dried figs significantly. The control sample (untreated) was strongly disliked by the panel members. It was also observed from Table 1 that the pretreatment T_1 has better effect on colour and appearance property than any other pre-treatment. The blanching + sulphitation developed the golden yellow colour of dried figs whereas the untreated sample and sample treated with treatment T_2 developed the blackish colour. The colour of sample subjected to treatment T_3 was also found to have good colour. This treatment retained the original colour of fruits. Panelists rated treatment T_3 second next best to treatment T_1 and assigned the mean score value of 7.30.

Table 1 : Sensory score of dried figs as affected by pre-treatments

Sample	Color and appearance	Taste	Flavour	Texture	Overall acceptability
T_0	4.30	5.40	5.90	3.0	4.0
T_1	8.0	8.20	8.30	8.50	8.50
T_2	6.20	7.30	7.20	8.0	7.50
T_3	7.30	8.0	8.20	8.35	8.0
S.E.±	0.19	0.15	0.12	0.16	0.10
C.D. (P=0.05)	0.61	0.50	0.39	0.53	0.32

T_0 – untreated / control sample
T_1 – Blanching +Sulphitation (KMS)
T_2 – Blanching +Ammonium carbonate
T_3 – Ammonium carbonate + Potassium Metabisulphite (KMS)

Taste:

Significant difference was found between the taste characteristic of untreated and treated sample. However, the taste of sample has not been affected significantly within the treatments. The figs subjected to pre-treatment T_1 were mostly liked by the panel members followed by figs subjected by pretreatment T_3. The control sample was neither liked nor disliked by the panel members.

Flavour:

The results of flavour characteristic of dried figs were quite similar to the results found with taste characteristic. No significant difference was observed within the treatments, though the difference in flavour characteristic was significant between the treated and untreated samples. The sample of treatment T_1 was found to be best for its flavour characteristic among all the samples. The control sample was assumed to be worst by panel members. The average sensory score (8.20) of sample treated with treatment T_3 was very close to the average sensory score (8.30) of sample treated with treatment T_1. The mean value of sensory score of figs treated with treatment T_2 was 7.20.

Texture:

The pre-treatments have profound influence on the textural characteristic of dried figs. The texture of untreated sample was strongly disliked by the panel members and they assigned only 3.0 average sensory score to this sample. The texture of figs subjected to pretreatment T_1 was found to be better than all other samples. The texture of sample subjected to treatment T_3 was at par with the sample subjected to treatment T_1. The texture of fig fruits treated with blanching and ammonium carbonate was also liked very much by the panel members.

Overall acceptability:

The dried figs subjected to pre-treatment T_1 assigned highest value of sensory score and were liked very much to extremely by the panel members. The control sample was proved to be worst and was disliked very much by the panel members. The other two samples *viz.*, samples subjected to treatments T_2 and T_3 has fetched the mean score value of 7.50 and 8.0, respectively. These samples were rated in the range of liked moderately to liked very much by the panelists (Fig. 2).

Effect of pretreatments on drying kinetics of dried figs:

The drying kinetics of fig fruits was studied by taking sample at 5 hours interval each during drying process and was subjected to the moisture analysis. The kinetics of drying of the fruits are reported in Fig. 1.

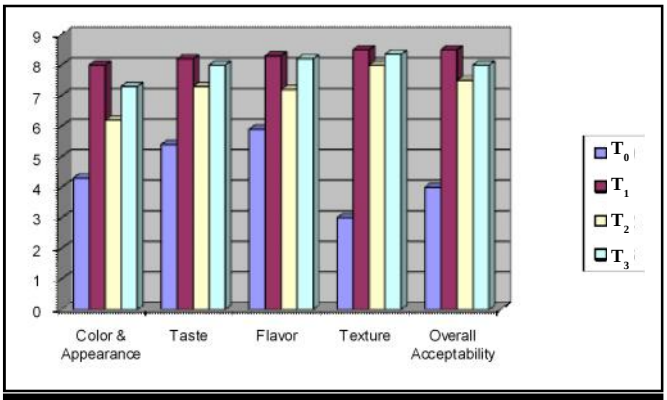

Fig. 2 : Sensory quality of dried/dehydrated Figs as affected by different pretreatments

The time needed to reach the estimated 20 per cent water content was strongly influenced by the pretreatments; all the pretreatments significantly reduced the drying times. Blanching + sulphitation and ammonium carbonate + potassium metabisulphite pretreatments allowed figs to dry in 22 and 20 hrs, respectively, while the untreated fruits took 42 hrs, a time saving of 20 to 22 hrs. The fig fruits pretreated with blanching + ammonium carbonate took 21 hours to reach the estimated moisture content of 20 per cent. No significant differences were observed between the treatments (Fig. 3).

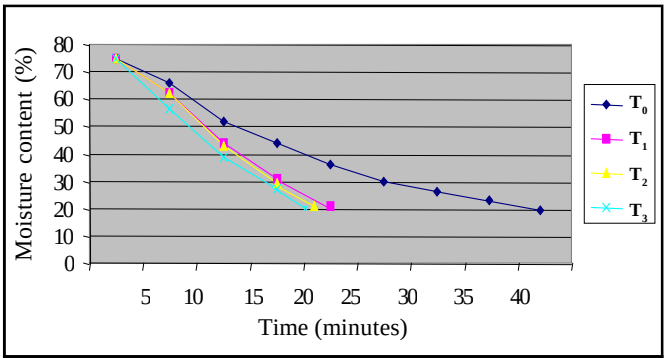

Fig. 3 : Drying kinetics of dried figs as affected by different pretreatments

The slope of the drying curve reveals that the constant rate period was attained only 3 to 6 hrs of processing. Thus, in general, the drying process showed only a falling rate period.

Conclusion:

The best quality dried figs were obtained when they

are given the pretreatment of blanching and KMS dip. The dried figs prepared by giving pretreatment with ammonium carbonate and KMS dip were also found fair with respect to sensorial quality parameters. The various pretreatments given to fresh fruits before drying also reduced the drying time significantly over the control sample. The fruits pretreated with ammonium bicarbonate and KMS dip took least time (20 hrs) for drying (20% m.c.) than other treatments.

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