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Research Paper :

Effect of intermittent drying technique on effective drying time for preparation of *Anardana*

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ABSTRACT

Pomegranate arils with 2,3 and 4 per cent citric acid treatment were dried by using intermittent drying cycles *viz.*, 1: 0.5 , 1:1, 1.5 : 0.5, and 1.5:1 at temperature 50^{0}C and 60^{0}C. Cabinet tray drier was used for drying purpose. The pomegranate arils were dried from intial 400% (D.B) m.c. to final 6.75 to 7.50 % (D.B) m.c. The arils without pretreatment were taken as control. The effective drying time in intermittent drying was less as compare to continues drying. The maximum acceptability of *Anardana* was found in case of 3% citric acid treatment dried at 60 C for intermittent drying cycle 1.5 to 0.5h.

Key words : Effective drying time, *Anardana*, Intermittent drying, Pretreatments, Drying cycle, Tempering, Drying

The production of sweet pomegranate varities is maximum in Maharashtra. But processing of this fruit such as juice, wine, anar-rub, jelly, squash, sherbet, concentrate, *Anardana* is not up to the mark. The present study was undertaken to prepare *Anardana* from sweet varity (Ganesh) grown in M.S. The sweet varieties are treated with citric acid to increae acidity of *Anardana*. The *Anardana* has good keeping qualities along with certain advantages such as flavour and stability at room temperature over a long storage period, protection from enzymatic and oxidative spoilage, light weight for transport beside elimination of costly refrigeration. The *Anardana* is used as an acidulant in curries and chutneys in place of tamarind and Amchur in north India. *Anardana* is sold at various places through out the country and is also exported for using in various industries like tannin, coloring etc. (Anonymous, 1969).

To prepare *Anardana*, the excess moisture must be removed by a drying process. Various methods have been used by many workers. However, suitable drying method has not yet been developed. An attempt was, therefore, made by using intermittent drying to obtain good quality *Anardana*. It also helps to save the power required for drying and improves quality of *Anardana*.

METHODOLOGY

Sample preparation :

Fresh fruits of pomegranate (Ganesh) which were disease free, uniform size, fully mature and with good appearance were procured from local market. The fruits were whahed with water and the arils were manually separated. The sample was pretreated with citric acid of different concentrations *i.e.*2,3 and 4% .The sample was weighed by using simple balance.

Moisture content:

Moisture content of pomegranate arils was determined on a wet basis by using standard oven method. A sample of 15 g was weighed by using electronic balance with three replications and was kept in electric oven for 24 h at 100^{0}C ± 1^{0}C. The sample was then taken out from the oven and kept in desiccator for 20 minutes. Then sample was weighed to determine the final bone dry weight of pomegranate arils.

The Moisture content was determined by using the formula given below. (Chakraverty, 2000)

$$\text{Moisture content \% (w. b.)} = \frac{W_1 - W_2}{W_1} \times 100$$

where,

W_1 = Weight of wet sample, g

W_2 = Weight of bone dry sample, g

Moisture content on dry basis was obtained by dividing moisture by bone dry weight and then multiplying it by 100.

To determine the moisture loss a separate sample of 25g was taken in mesh wire and the weight was taken at

regular interval by using electric balance.

Intermittent drying cycles:

Four intermittent drying cycles *viz.*, 1:0.5, 1:1, 1.5:0.5 and 1.5:1h (drying : tempering) were used for drying. Drying was carried out at 50^{0}C and 60^{0}C by using tray dryer. The dryer was 'on' during drying period while it was kept 'off' during tempering period. The treatments of citric acid were given by spraying the measured quantity of cirtic acid on arils and mixed thoroughly. The drying was carried out until the desired level m.c. in the arils was reached. Effective drying time means time during which dryer was 'on'.

RESULTS AND DISCUSSION

The Table 1 show relationship between moisture content and effective drying time for the sample dried by using different intermittent drying cycles and pretreatments

Drying at 50^{0}C:

It is clear from Table 1 that in this case of intermittent tray drying, cycle 1:0.5 h, the effective drying time required to reach the desired level of moisture content was 5.5 hours as compared to total 8 hours drying time.

Where as intermittent tray drying the effective drying, time required to reach the desired level of moisture was 6 hours as compared 12 hours with tempering period. (drying cycle 1:1 h.). It can be seen from Table 1 that effective drying time required to reach the desired moisture level was 4.5 hours against 6 hours including tempering time for drying cycle 1.5:0.5 h.

While for cycle 1.5:1 h that effective drying time required to reach the desired moisture level was 5.5 hours as compared to total drying period 8.5 hours.

Drying at 60^{0}C:

It can be seen from Table 1 that effective drying time required to reach to desired moisture level was 3.5 hours as compared to total drying time of 5 hours for drying cycle of 1:0.5 h. The effective drying time required to reach the desired moisture level was 4 hours as compared to total drying time 8 h (drying cycle 1:1 h). It is also evident from Table 1 that for intermittent drying cycle 1.5:0.5 h, effective drying time required to reach the desired moisture level was 3 hours as compared to total drying time 4 hours. While for intermittent drying cycle 1.5:1 h the effective drying time required to reach the desired moisture level was 3.5 hours as compared to total drying time 5.5 hours.

From the present results it was observed that temperature 60^{0}C was more effective as compared to 50^{0}C. For 50^{0}C minimum effective drying time (without tempering) was 4.5 h and maximum drying time was 6 h. In case of 60^{0}C minimum effective drying time 3 h and maximum drying time 4 h were required. Thus 1.5 to 2.0 h time saved at 60^{0}C as compared to 50^{0}C (Fig. 1).

In continuous drying, total time required for drying was more as compared to intermittent effective drying time. About eight hours were required in case of drying at 50^{0}C. Whereas about 6 hours were required in case of drying at 60^{0}C. Continous drying required more energy as compared with intermittent drying. Because total energy supplied was not used in drying process as the rate of moisture migration was slow. This is clear from the results obtained by Nawale and Kulkarni (1999) and Hol and Sonwane (2000).

Intermittent drying was found better method for

Table 1 : Intermittent drying cycles

Intermittent drying cycle(hr)	Temperature (^{0}C)	Time required for drying	
		Total	Effective
1 : 0.5	50	8	5.5
1 : 1	50	12	6
1.5 : 0.5	50	6	4.5
1.5 : 1	50	8.5	5.5
1 : 0.5	60	5	3.5
1 : 1	60	8	4
1.5 : 0.5	60	4	3
1.5 : 1	60	5.5	3.5

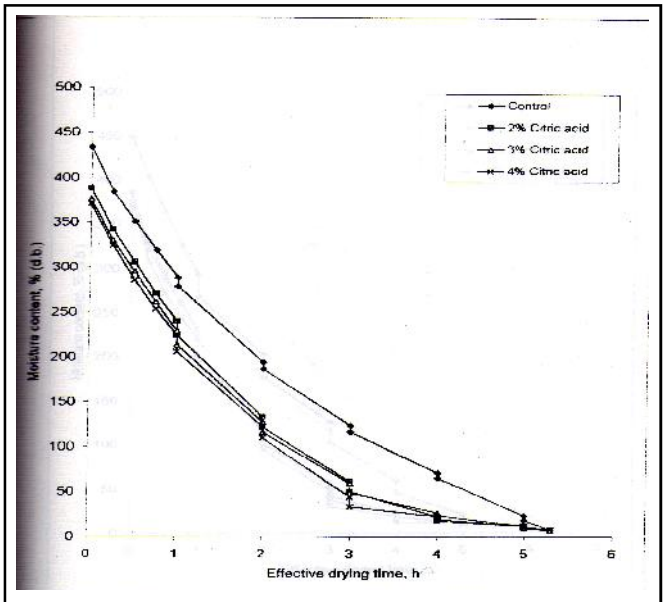

Fig. 1 : Effect of effective drying time on moisture content of pomegranate arils at 50^0 C with an intermittent drying time of 1:0.5 h.

drying *Anardana*. It not only removes the moisture in the tempering period but also facilitates further drying cycle. The intermittent drying approximately save 20-25 energy and the drying time. It was found that Rs. 5.26/kg were required for the preparation of *Anardana*.

It has been concluded that good quality *Anardana* can be prepared by using intermittent drying technique.

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