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Effect of drying on colour degradation and rheology in red chilli cv. BYADAGI

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ABSTRACT

The freshly harvested red chilli (*Capsicum annum*) of Byadagi variety was subjected to conventional thin layer hot air drying to evaluate the degradation of colour and red pigment of red chilli at different moisture content of 10-80 % (wet basis). The above characteristics were studied based on absorbance ratio using spectrophotometer at different wavelengths. The results indicated that colour values were increased with decrease in moisture content. The absorbance ratio and red pigment values were decreased with decrease in moisture content. The unit colour of red chilli at different moisture content ranging between 10- 80 % (wb) would predicted by a linear equation C = -604.53M+84228 with correlation coefficient R^2 = 0.9823.

Key words : Red chilli, Drying, Colour deyradation, Rheology.

Red chillies are the dried ripe fruit of the species of genus capsicum. India produces 68 million tonnes of green chillies per annum, which is the second largest producer in the world after China (Srivastav *et al.,* 2006). The most important quality characters in chillies are colour and pungency. It is used as a condiment or culinary supplement are subjected to long term storage. During that time important physical, chemical and biological changes takes place which have major impact on colour and pungency (Kaleemullah and Kailappan, 2007).

Red ripe chillies at the time of harvest contains high moisture (300 - 400 % db) so, they are highly perishable which needs processing and storage at optimum moisture condition. It is of considerable importance for the farmers as well as to processors and consumers. The shelf life of freshly harvested chillies is estimated to be 2-3 days based on 12-15 % cumulative loss. Reducing the moisture and providing aeration to the chillies after harvesting is essential to avoid development of micro flora and subsequent loss of quality or even total spoilage. Therefore, chillies need to be dried quickly to safe moisture content to 11 % (db) without impairing colour and pungency (Kaleemullah and Kailappan, 2006). Knowledge of the rheological properties of food purees is essential for product development and design evaluation of process equipment (Ahmed *et al.,* 2000). Hence, this investigation was carried out to know the effect of moisture on the degradation of colour and red pigment.

MATERIALS AND METHODS

Preparation of puree (sample) :

Red ripe chillies of Byadagi variety were washed in running tap water, destalked manually. A known weight of fresh chillies was taken , further dried to the required moisture content and powdered the material using grinder. The powder was extracted using a solvent acetone with sufficient contact time till the extraction is complete and the volume was measured. Then 10 ml of solution was transfered into a weighed Petridish and evaporate the solvent completely in steam bath. After the evaporation cool the dish and the weight of the residual material in the dish was recorded. Further this sample was used for analysis like absorbance ratio and for the estimation of red pigment, capsaicin and colour.

Colour Measurement:The prepared sample (puree) of 0.5 g was transferred into 100 ml volumetric flask and volume was made upto the make using acetone and 1.0 ml of this sample was pippeted out to second 100 ml volumetric flask and again was made to 100 ml using acetone and the mixture was shaked well for uniform mixing. Colour was measured by using spectrophotometer at 462 nm by using acetone as a blank at the absorbance of 0.01 % prepared solution (oleoresin). This value was multiplied by 66,000 to obtain unit colour value. Each experiments was replicated thrice and average value were used in the analysis of results.

Absorbance ratio :

Prepared sample (0.5 gm) was transferred to 50 ml flask and volume was made to 50 ml using acetone. 0.5 ml of sample was diluted to 50 ml with acetone. Absorbance was measured at 470 nm and 455 nm against acetone as blank. Each experiments was replicated thrice and average value were used in the analysis Of results. Therefore, the absorbance ratio is-

$$\text{Absorbance ratio} = \frac{\text{Absorbance at 470 nm}}{\text{Absorbance at 455 nm}} \quad \text{.....(1)}$$

Red pigments in red chilli :

The same solution was also used to record red pigment by measuring the absorbance at 495 nm and 422 nm

$$\text{Per cent Red Pigments} = \frac{A495}{A422} \times (72.5 - 24.5) \quad \ldots\ldots\ldots(2)$$

RESULTS AND DISCUSSION

The experimental results indicated (Table 1 and Fig. 1) that unit colour value lies in the range of 37950 to 80982 in the moisture range of 10-80 % (wb) of red chilli. At 80 % moisture content the unit colour value was 37950 Cv, which is very high compared to 10 % moisture content. The reduction in unit colour was 53.13 % at 80 % moisture content compared to 10 % moisture content. This is because acetone may not diffuse the total carotenoid pigment present in chilli and it has hindered the extraction process due to high moisture content. Hence, unit colour value obtained was less at 80 % (wb) moisture content.

Table 1 : Effect of moisture content on the unit colour, absorbance ratio and red pigment percentage of red chilli

Moisture content (wb)	Sample weight g	Unit colour Cv	Abs. ratio	Red pigment %
80	0.50	37950	1.003	81.68
70	0.50	42966	0.991	54.44
60	0.50	47652	0.988	52.09
50	0.50	50556	0.982	51.54
40	0.50	58674	0.978	49.83
30	0.50	65406	0.970	48.54
20	0.50	80982	0.968	47.73

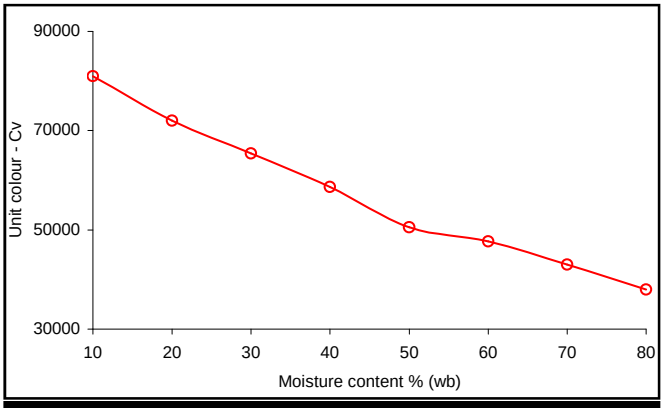

Fig. 1: Variation of unit colour on moisture content of red chilli

Similarly the unit colour value at 70 % was 42966 Cv as compared to 10 % (wb) of 80982 Cv. The reduction in unit colour was 46.94 % at 70 % moisture content as compared to 10 % moisture content. The increase in colour value may be due to concentration of colour with loss of water.

Fig.1 shows the variation of unit colour on moisture content in the range of 10-80 % (wb) of red chilli.

At 60 % moisture content the unit colour value at 60 % was 47652 Cu as compared to 10 % (wb) of 80982 Cv. The reduction in unit colour was 41.15 % with respect to 10 % moisture content product. The gradual increase in colour may be attributed to higher efficiency of extraction media. The product obtained at 50 % moisture content taken for colour analysis. The moisture content is reduced by 30 % (wb). The unit colour value at 50 % was 50556 Cv as compared to 10 % (wb) of 80982 Cv. The reduction in unit colour value was 37.57 % with respect to 10 % moisture content product. The gradual increase in colour may be attributed to higher efficiency of extraction media as less water content turns to higher diffusion.

At 40 % moisture content the unit colour value at 40 % moisture content was 58674 Cv as compared to 10 % (wb) of 80982 Cv. The reduction in unit colour value was 27.54 % with respect to 10 % moisture content product. The gradual increase in colour may be attributed to higher efficiency of extraction media as less water content turns to higher diffusion. The colour value at 30 % moisture content was 65406 Cv as compared to 10 % (wb) of 80982 Cv. The reduction in unit colour value was 19.23 % with respect to 10 % moisture content product. The extract media becoming more capable for diffusion process the gradual colour increase may be noticed.

The same procedure is adopted where the moisture content is reduced by 60 % (wb). Here, the fruit is exposed to heat for longer time in the dryer. The solvent mixture used to mix with 60 % reduced moisture content increase the extraction process. At 20 % (wb) the unit colour value was 72006 Cv as compared to 10 % (wb) of 80982 Cv. The reduction unit colour value was 11.08 % with respect to 10 % moisture content product. The 10 % moisture content was taken as a standard reference because the red chillie will retain 10 % as inherent moisture for safety and storage condition. Hence, it was compared as a check with higher moisture contents. The unit colour value at 10 % (wb) was 80982 Cv. The unit colour of red chilli at different moisture content range from 10-80 % (wb) would be predicted by linear equation $C = -604.53M+84228$ with correlation coefficient $R^2 = 0.9823$ where C is unit colour and M is moisture ratio.

Fig. 2 shows the absorbance ratio on moisture content ranging between 10-80 % (wb) of red chilli.

The absorbance ratio lies in the range of 0.968-1.003 ranging between 10-80 % (wb) moisture content. The

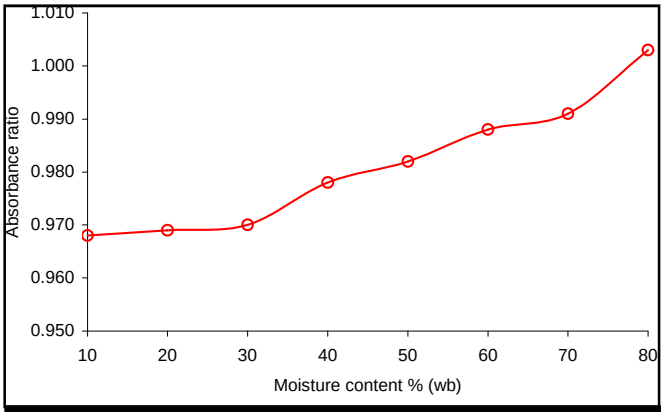

Fig. 2: Shows the absorbance ratio on moisture content of red chilli

absorbance ratio decreased with decrease in moisture content because caroteniod pigment being thermal sensitive and is presented in the Table 1. The absorbance of red chilli at different moisture content ranging from 10-80 % (wb) would be predicted by linear equation A_3 = 0.0005M+0.959 with correlation coefficient R^2 = 0.9428 where A_3 is absorbance ratio of red chilli.

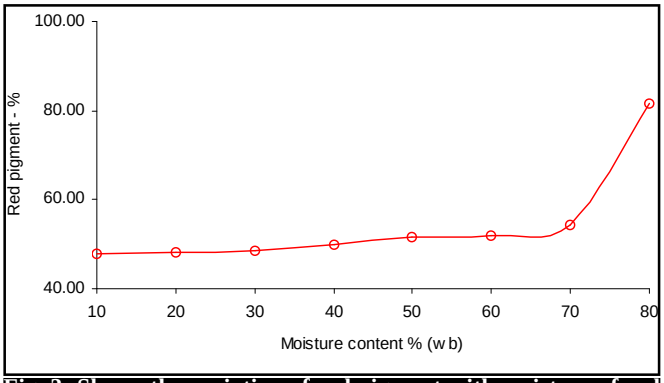

Fig. 3: Shows the variation of red pigment with moisture of red chilli

Fig. 3 shows the variation of red pigment with moisture in the range of 10-80 % (wb) of red chilli.

The red pigment lies in the range of 47.33 to 81.68 % for moisture ranging between 10-80 % (wb) of red chilli. At 80 % moisture content the red pigment is high as compared to lower moisture content because oxidation of carotenoid pigment present was not exposed to heat. The red pigment decreased with decrease in moisture content because carotenoid pigment present in the chilli was heat sensitive. The red pigment value of red chilli at different moisture content range from 10-80 % would be predicted by linear equation R = 0.3355M+39.129 with correlation coefficient R^2 = 0.5264. For 10–70 % moisture content the red pigment value of red chilli would be predicted by linear equation R = 0.111M+45.863 with correlation coefficient R^2 = 0.9436 where R is red pigment of red chilli. In this study the unit colour, absorbance ratio and red pigment were investigated by using spectrophotometer. The absorbance ratio and red pigment decreased with decrease in moisture content. The unit colour increased with decrease in moisture content. The kinetics of unit colour degradation of red colour is presented by a linear equation C = -604.53M+84228 with correlation coefficient R^2 = 0.9823 for a moisture content of 10- 80 % (wb).

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