Effect of pre-treatments on dehydrated Kasuri methi (Trigonella corniculata L.)

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Abstract
Kasuri methi (Trigonella corniculata L.) is a popular leafy vegetable use as a spices in India. Kasuri methi is mainly grown for green herbage as well as dried herb. To achieve the target of feeding the increasing population as well as meeting the requirements of the raw material for processing industry and export trade, only increase in area and productivity of crops are not enough. Much attention needs to be given on post-harvest management and value addition of these perishable vegetable crops. Keeping this in view, present investigation entitled “Effect of Pre-Treatments on Dehydrated Kasuri Methi (Trigonella corniculata L.)” was carried out during the year 2016-17 at Post Harvest Technology Laboratory, College of Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to study the effect of different pre-treatments on physicochemical properties of dehydrated kasuri methi and to find out the suitable pre-treatment for better quality of dehydrated kasuri methi.

The observations in respect to physical and chemical evaluation were recorded periodically at 30 days of intervals from 1st day of storage upto 180 days of storage period of dried kasuri methi. At the end of storage period, pre-treatment i.e. T9 Blanching in water + Stepping in 0.15% NaHCO₃+0.15% MgO for 2 minutes were recorded significantly minimum dehydration ratio and moisture content, while significantly maximum rehydration ratio, ascorbic acid, chlorophyll, protein and oleoresin content.

Keywords: Kasuri methi, pre-treatments, blanching, dehydration

Introduction
Kasuri methi (Trigonella corniculata L.) is a popular leafy vegetable use as a spice in India. Kasuri methi (Trigonella corniculata L.) is herbaceous, bushy, slow growing remains in a rosette conditions during most of its vegetative growth period, which produces bright orange to yellow flowers. It produces sickle shaped pods smaller than the common methi. (Som and Maiti, 1986) [12], Kasuri methi mainly grown for green herbage as well as dried herb. Dried leaves are used as a spice to add aroma and flavour to the food products.

Green leafy vegetables are extensively used in various cooked and processed form. Green leafy vegetables are gaining importance, mainly because of being good source of vitamins, minerals and dietary. The fenugreek green leaves supply 35 k calories and contain moisture 86.1%, protein 4.4%, fat 0.9%, fibre 1.1%, other carbohydrate 6.0% and ash 1.5%. in addition, the fenugreek leaves are rich in vitamins and contains carotene content 2.34 mg, thiamine 0.04mg, riboflavin 0.31mg, nicotinic acid 0.8mg and vitamin C 52.0mg/100g edible portion. (Duke, 2003) [1].

Pre-treatments are the necessary pre-requisites for successful dehydration process, to minimize drying losses various pretreatment are used. Pre-treatments check the undesirable physico-chemical and other qualitative changes that may occur during drying process and subsequent storage and to extend keeping quality of dried products. Blanching is one of the pre-treatment given to minimize the microbial load and deactivate the enzymatic activity to prevent the browning reaction, also reduced the greeness degradation of the product.

Materials and Methods
The present study was conducted in Post-Harvest Technology Laboratory, College of Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the 2016-2017. The experiment was laid out in nine Pre-treatments viz., T9- Blanching in water for 2 minutes (Control), T1- Blanching in water + stepping in 0.10% NaHCO₃ for 2 minutes, T3- Blanching in water + stepping in 0.15% NaHCO₃ for 2 minutes, T2- Blanching in water + stepping in 0.10% NaHCO₃ for 2 minutes, T2- Blanching in water + stepping in
0.10% MgO for 2 minutes, T9- Blanching in water + stepping in 0.15% MgO for 2 minutes, T10- Blanching in water + stepping in 0.10% NaHCO3 + 0.10% MgO for 2 minutes, T11- Blanching in water + stepping in 0.15% NaHCO3 + 0.10% MgO for 2 minutes, T12- Blanching in water + stepping in 0.15% NaHCO3 + 0.15% MgO for 2 minutes with three replications

Healthy, fresh matured, disease free kasuri methi leaves obtained from Chilli and Vegetable Research Unit, Dr. PDKV Akola. The leaves were washed in clean tap water to remove the contamination like dirt, mud etc. Then destalking was done with the help of sharp a stainless steel knife. After that water was removed by putting them on blotting paper. The kasuri methi leaves (1000 g / treatment / replication) were subjected as per different treatments. Blanching was carried out in boiling water for 2 minute.

The steeping solution of NaHCO3 (0.10%), NaHCO3 (0.15%), MgO (0.10%), MgO (0.15%), NaHCO3 (0.10%)+MgO(0.10%), NaHCO3 (0.10%) MgO (0.15%), NaHCO3 (0.15%) + MgO (0.10%) and NaHCO3 (0.15%) + MgO (0.15%) were prepared in water as per the treatments. The pieces of 3 to 5 cm length were made without causing any bruising to tender leaves of kasuri methi were dipped in the solutions for the 2 minutes. At the end of treatment period, the kasuri methi leaves were taken out and drained (Tandon and Virmani, 1980) [4].

During the storage observations of the dried sample were recorded for its change in chemical properties at every 30 days interval up to 180 days. The physical and chemical parameters like dehydration ratio, rehydration ratio, moisture, chlorophyll, ascorbic acid and oleoresin from dried kasuri methi leaves were determined according to methods of Ranganna (1979) [11].

Experimental findings
Effect of pre-treatments on dehydration ratio
The data presented in table 1 regarding effect of pre-treatments on dehydration ratio revealed, significant differences among the different pre-treatments. Significantly lowest (6.14) dehydration ratio was observed in pre-treatment T0 which was followed by pre-treatment T1 (7.23), whereas pre-treatment T7 was at par with rest of other pre-treatments. However, significantly highest (8.47) dehydration ratio were recorded in pre-treatment T1 i.e. control.

Effect of pre-treatments on rehydration ratio
At the 1st day of storage, the data regarding effect of pre-treatments on rehydration ratio was recorded non-significant differences
When the observations taken at 180th day of storage, the pre-treatment T0 recorded significantly maximum (4.84) rehydration ratio, which was followed by pre-treatment T3 (4.41) and was at par with the T2, T5, T6, T4 and T1 pre-treatments. While, significantly minimum (3.50) rehydration ratio was found in pre-treatment T1 i.e. control. During the storage of dried kasuri methi leaves on 180th days of storage, rehydration ratio was recorded in slightly increasing trend due to change in humidity and temperature and therefore moisture content was slightly decreased. The progressive decrease in rehydration ratio was notified in all the dried samples. It might be possibly due to hygroscopic nature of the dried kasuri methi leaves, which absorbed the moisture during storage. Similar results were also reported by Shams-Ud-Din and Shirazi (2008) [10] and Gupta et al (2008) [3] in green leafy vegetables.

Higher rehydration ratio indicates higher capacity of dried sample to re absorb water. The re absorption capacity related to the tissue integrity and structure, i.e. lower the disturbances in the tissue structure of the vegetable during drying period; higher will be the capacity of dried tissue to re absorb moisture during rehydration.

Similar results of increased rehydration ratio in the bitter gourd slices blanched in brine solution were reported by Manimegalai et al. (1998) [12] in bitter gourd and Hiremath et al. (2009) [13] and Kalaskar et al. (2012) [14] in dried fenugreek.

Effect of pre-treatments on moisture content
The effect of different pre-treatments on moisture content of dried kasuri methi leaves was recorded and found increasing in trend throughout the storage period.
At the 1st day of storage, data was recorded non-significant differences. However, the pre-treatment T0 recorded minimum (5.83%) moisture content and maximum (7.08%) moisture was recorded in T1 pre-treatment. At 180th day of storage, pre-treatment T0 recorded significantly minimum (8.19%) moisture content which was followed by pre-treatment T2 (9.03%) and pre-treatment T3 was statistically at par with pre-treatments T1, T5 and T1. However, maximum (10.45%) moisture content in dried kasuri methi leaves was recorded in pre-treatment T1 i.e. control.

It was observed from the data that moisture content in dried kasuri methi leaves increased with advancement of storage period. The increasing trend might be due to gain of moisture by the dried leaves from the atmosphere. The gain of moisture was highest in control as compared to pre-treatment of blanching in 0.15% NaHCO3+0.15% MgO cabinet drying. The progressive increase in moisture content was notified in all the samples dried by cabinet and sun drying method. It might be possibly due to hygroscopic nature of the leaves, which absorbed the moisture during storage.

Similar kinds of observations were also recorded by Kalaskar et al. (2012) [14] in dried fenugreek leaves, Siva Kumar (1991) [11], Jadhav et al. (2009) [15] and Mudgal et al. (2009) [16].

Effect of pre-treatments on ascorbic acid content
A critical appraisal of the data showed that there were significant different among the pre-treatments except first day of storage. On the 1st day of storage data was noted non-significant. However, pre-treatment T0 recorded maximum (27.22 mg/100g) ascorbic acid, whereas the minimum (24.50 mg/100g) was recorded in pre-treatment T1 i.e. control.
On the 180th day of storage pretreatment T0 recorded significantly maximum (25.57 mg/100g) ascorbic acid content, which was followed by pre-treatment T5 (24.82 mg/100g) and pre-treatment T9 were at par with pre-treatment T3, T6, T9, T1 (24.54 mg/100g, 24.43 mg/100g, 24.38 mg/100g respectively.), whereas significantly minimum (22.19 mg/100g) ascorbic acid content was recorded with the pre-treatment control i.e. T1.

Some of antioxidants are reducing agents and essential equipment for higher retention of ascorbic acid during dehydration and subsequent storage and thereby help to extent the keeping quality of dried product. The decreased trend of ascorbic acid was found mostly due to its oxidation and as substrate in non-enzymatic browning during the storage, period and also ascorbic acid is very sensitive to heat. It might
be lost due to application of heat during drying. But in water blanching there was less retention because ascorbic acid is water soluble and oxidation takes place during blanching. The maximum loss of ascorbic acid content observed in control samples. These results are in good agreement with the results reported by Manimegalai et al. (1998) [7] and Viresh Hiremath et al. (2009) [8] in bitter gourd. Gupta et al. (2008) [9] in leafy vegetables and Kalaskar et al. (2012) [10] in dried fenugreek leaves.

Effect of pre-treatments on chlorophyll content

The data pertaining to the chlorophyll content of dehydrated kasuri methi leaves presented in table 2 as influenced by different pre-treatments was found significant among them except first day of storage. The data related to chlorophyll content was found non-significant on 1st day of storage, the maximum (3.80 mg/100mg) chlorophyll content was noticed in pre-treatment T5, while minimum (3.38 mg/100mg) was recorded in pre-treatment T1. On 180th day of storage, chlorophyll content was found significantly maximum (3.28 mg/100 mg) in pre-treatment T5, which was followed by pre-treatment T4 (3.10 mg/100 mg) and was at par with pre-treatment T3 (3.08 mg/100 mg), while significantly minimum (2.69 mg/100 mg) chlorophyll content was observed in pre-treatment T1 i.e. control. Total chlorophyll is the main chemical component responsible for the green colour of the vegetables; it was determined in the dehydrated kasuri methi leaves at different stages of storage. In the present study, total chlorophyll content was significantly affected not only by the pre-treatments and drying methods, but also by the storage periods. The pre-treatments have showed distinct effect on the retention of chlorophyll content while pre-treatment helped to maintain higher chlorophyll level than control. Similar results in conformity to these findings were also reported by Bajaj, et al. (1993) [11] in case of dehydration of fenugreek leaves.

Effect of pre-treatments on protein content

The effect of different pre-treatments on protein content of dried kasuri methi leaves were found non-significant during 1st day of storage upto 180th day of storage.

Effect of pre-treatments on oleoresin content

During the 1st day of storage of kasuri methi leaves up to the 180th day of storage, the data regarding oleoresin content was found non-significant due to different pre-treatments on dried kasuri methi leaves.

Table 1: Effect of pre-treatments on dehydration and rehydration ratio of kasuri methi

| Treatments | Dehydration ratio | Rehydration ratio |
|------------|-------------------|-------------------|
|            | Storage days       |
|            | 1st day | 180th day | 1st day | 180th day | 1st day | 180th day | 1st day | 180th day |
| T1         | 8.47    | 3.61      | 3.50    | 3.41      | 3.07    | 2.92      | 2.90    | 2.96      |
| T2         | 7.41    | 4.01      | 3.93    | 3.39      | 3.15    | 2.69      | 2.63    | 2.69      |
| T3         | 7.41    | 4.19      | 4.13    | 3.79      | 3.70    | 4.20      | 4.14    | 4.14      |
| T4         | 7.50    | 4.38      | 4.30    | 7.34      | 4.32    | 4.24      | 4.23    | 4.23      |
| T5         | 7.23    | 4.47      | 4.31    | 7.48      | 4.51    | 4.41      | 4.40    | 4.40      |
| T6         | 6.14    | 4.90      | 4.84    | 6.41      | 5.20    | 4.76      | 4.69    | 4.69      |

Conclusions

On the basis of findings reported in the present investigation it can be concluded that pre-treatments played an important role in the quality of dehydrated kasuri methi leaves. At the end of storage period, pre-treatment i.e. T0 Blanching in water + Stepping in 0.15% NaHCO₃+0.15% MgO for 2 minutes were recorded significantly minimum dehydration ratio and moisture content, while significantly maximum rehydration ratio, ascorbic acid, chlorophyll, protein and oleoresin content. During storage, the physio-chemical parameters like moisture, showed the increasing trend while, rehydration ratio, ascorbic acid, chlorophyll, protein and oleoresin content was shown the decreasing trend with the advancement of storage period.

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