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Krishna D Kurubetta

Assistant Professor of
Agronomy, Horticulture
Research and Extension Station,
Devihosur, Haveri, Karnataka,
India

M Abdul Kareem

Assistant Professor of
Agronomy, Horticulture
Research and Extension Station,
Devihosur, Haveri, Karnataka,
India

TB Allolli

Assistant Professor of
Agronomy, Horticulture
Research and Extension Station,
Devihosur, Haveri, Karnataka,
India

RK Mesta

Assistant Professor of
Agronomy, Horticulture
Research and Extension Station,
Devihosur, Haveri, Karnataka,
India

MH Tatagar

Assistant Professor of
Agronomy, Horticulture
Research and Extension Station,
Devihosur, Haveri, Karnataka,
India

K Sweta

Assistant Professor of
Agronomy, Horticulture
Research and Extension Station,
Devihosur, Haveri, Karnataka,
India

Corresponding Author:**Krishna D Kurubetta**

Assistant Professor of
Agronomy, Horticulture
Research and Extension Station,
Devihosur, Haveri, Karnataka,
India

Methods of drying on fruit quality of Byadagi chilli

Krishna D Kurubetta, M Abdul Kareem, TB Allolli, RK Mesta, MH Tatagar and K Sweta

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Abstract

The experiment was conducted to study the effect of different drying methods in red chilli (Byadagi dabbi) at Horticultural Research and Extension Station, Devihosur, Haveri, Karnataka, during 2016 and 2017 in *rabi* season. Drying in solar tunnel dryer method is found to be the best option in field situation for reducing the average drying period (6.0 days) and significantly least per cent of white fruits (7.5 %), as compare to other treatments. This was mainly due to increased average maximum temperature (54.2 °C), minimum temperature (29.2 °C) and reduced relative humidity (57 %) compared to outside temperature (T_{max} - 36° C & T_{min} -18 °C and RH – 74%). This resulted in rapid loss of moisture from the fruits and ultimately reduced the drying period and fruit whitening. The fruit quality parameters were not significantly affected by the methods of drying in chilli.

Keywords: Drying methods, fruit quality, chilli fruit, Byadagi chilli

Introduction

India is the largest producer and consumer of dry chillies. The chilli is a popular kitchen product of Indian household. It belongs to the genus *Capsicum*. The fruit amassed can be used dried to reduce moisture content to less than 10% and then consumed or exported. Drying is one of the aged practices in the World (Kaleemullah *et. al.*, 2006) [1]. It has been in use since time immemorial for various aims. Processing of food is the most common one. The primary target for drying is the reduction of moisture content. Materials with high moisture content can lead to various adverse concerns when stored for later use like bacteria, dust, pests and viruses. Drying also makes it easier to wrap up, store and ship the materials (Okos *et. al.*, 1992) [3]. In biomass production, the moisture content of the materials has to be maintained at the least for best results. The southern states of India stretched out close to the equator and is blessed through the year with a sunny and relatively dry climate especially, Karnataka and hence it is suitable for the use of solar energy in drying. The use of solar energy reduces the capital investment for any industry set up and it is non-polluting, renewable and infinite (Subahana *et. al.*, 2014) [4]. Conventionally, mature chillies are harvested from plants and dried in the open yards for 15 to 20 days. This method is time consuming, unhygienic and gives low yield owing to loss of seeds through breakage (Vijaykumar Palled *et. al.*, 2012) [5]. There may be chances of aflatoxin content in fruits due to fungal infection during drying process, which is a major threat for export of dry chilli. Hence, the quality of the fruit also depends on the method of drying.

Materials and Methods

The experiment was conducted to study the effect of different drying methods on quality of chilli fruits and to evaluate the suitable method for adopting the drying of chilli fruits. The experiment was conducted during 2016-17 to 2017-18 in *rabi* season at Horticultural Research and Extension Station, Devihosur, Haveri, Karnataka, India. The freshly harvested red ripe chilli fruits of variety 'Byadagi Dabbi' of normal uniform sample size of 20 kg for each treatment was used. The initial average (two years) fruit moisture was 71 per cent. The experiment was started on second fortnight of November in both the years (2006 & 2007). Drying process stopped when fruit moisture attained to 10 per cent. The eight different methods of drying (treatments) were studied with a statistical randomized complete block design with three replications. The treatment details are as follows: T1 - Drying in solar tunnel drier, T2 - Drying on cement concrete floor, T3 - Drying on polythene tarpaulin sheet, T4 - Oven drying (control), T5 - Drying on metal wire mesh, T6 - Drying on surface washed with dung slurry (farmers practice), T7 - Drying on surface of zinc sheets, T8 - Drying on bare soil

surface (farmers practice). The observations like drying period and percentage of white fruits and quality parameters in each treatment were recorded. The oven drying method (T4) is taken as control and drying on bare soil surface (T8) is most commonly practiced farmers method in northern

Karnataka. The solar tunnel dryer (T1) is made of UV (200 μ) stabilized polythene film was used as one of the treatment and the specifications as mentioned in Figure 1. The temperature and relative humidity outside and inside the solar tunnel dryer (Plate 1) was recorded during the experimentation (Table 1).

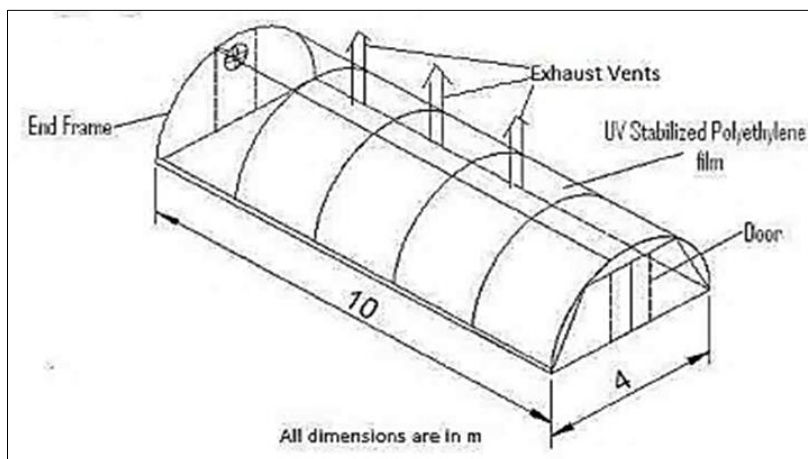


Fig 1: Solar Tunnel Dryer

Table 1: Average maximum, minimum temperature and relative humidity during experimentation (two years pooled)

| Parameters | Open area (Outside the solar tunnel dryer) | Inside the solar tunnel dryer |
|-----------------------------|--|-------------------------------|
| Average maximum Temperature | 36 °C | 54.2 °C |
| Average minimum temperature | 18 °C | 29.2 °C |
| Relative humidity | 74 % | 57 % |



Plate 1: Different methods red of chilli drying

Results and Discussion

The results of the two year experimentation revealed that, the different methods of drying had the significant influence on drying period and per cent of white fruits occurrence during the process (Table 1). Significantly less drying period of 1.5

days (36 hours) is observed in oven drying method (T4) as compared to other treatments. Drying in solar tunnel dryer is found to be the next best treatment for reducing the average drying period *i.e.* 6.0 days as compare to rest of the treatments. The significantly reduced drying period in solar

tunnel dryer was mainly due to increased (Table 1) average maximum temperature (54.2 °C) and minimum temperature (29.2 °C) compared to outside temperature (36 °C & 18 °C, respectively). The relative humidity noticed inside the solar tunnel dryer was 57 per cent as compared to outside relative humidity of 74 per cent. This increased temperature and reduced humidity inside the solar tunnel dryer contributed rapid loss of moisture from the fruits and ultimately reduced the drying period (6 days) as compared to other treatments. The pooled data also revealed that significantly extended drying period of 14 days was observed for the treatments drying on surface washed with dung slurry (T6) and drying on bare soil surface (T8) both methods are the most commonly followed farmers methods in Northern parts of Karnataka. The per cent white fruits (two years pooled data) obtained by different methods of drying also differed significantly. Significantly least per cent of white fruits (1.0 %) was noticed with oven drying method (T4) followed by drying in solar tunnel dryer (7.5 %) compared to other treatments. During night hours in open condition, the minimum temperature attains to 18 °C and there is a chance of accumulation of dew droplets and later there may be deposition of dust particles on fruit surface. Further, this may lead to fungal (*Aspergillus spp.*) infection and as a result contamination aflatoxin in the

fruits. This will have the drastic impact on drying period, fruit whitening and other quality parameters of dry chilli. The similar study with respect to effect of solar tunnel drier on chilli seed quality was also conducted by Kurubetta *et al.*, 2018 [2].

The treatments were not differed significantly for the quality parameters *viz.*, color, capsaicin and oleoresin. The aflatoxin content in the dry chilli fruits was also not detected during the period of experimentation in both the years. The similar results were also noticed by Kurubetta *et al.*, 2008.

Conclusion

In field situation, drying of red ripen chilli in solar tunnel dryer is found to be the best treatment for reducing the average drying period (6.0 days) with reduced fruit whitening (7.5 %) as compare to rest of the treatments. This was mainly due to increased average maximum temperature (54.2^o C), minimum temperature (29.2 °C) and reduced relative humidity (57 %) compared to outside temperature (Tmax – 36 °C & Tmin-18 °C and RH – 74%). This resulted in rapid loss of moisture from the fruits and ultimately reduced the drying period and fruit whitening. The fruit quality parameters were not significantly affected by the methods of drying in chilli.

Table 2: Effect of drying methods on drying period and white fruits of dry chilli

| Treatments | Drying Period (Days) | | | White fruits (%) | | |
|---|----------------------|---------|--------|------------------|---------|--------|
| | 2016-17 | 2017-18 | Pooled | 2016-17 | 2017-18 | Pooled |
| T1-Drying in solar tunnel drier | 6.0 | 6.0 | 6.0 | 9 | 6 | 7.5 |
| T2-Drying on cement concrete floor | 11.0 | 12.0 | 11.5 | 36 | 11 | 23.5 |
| T3-Drying on polythene tarpaulin sheet | 13.0 | 10.0 | 11.5 | 20 | 12 | 16.0 |
| T4-Oven drying (control) | 1.5 | 1.5 | 1.5 | 2 | 0 | 1.0 |
| T5-Drying on metal wire mesh | 14.0 | 12.0 | 13.0 | 39 | 22 | 30.5 |
| T6-Drying on surface washed with dung slurry | 15.0 | 13.0 | 14.0 | 42 | 10 | 26.0 |
| T7-Drying on surface of zinc sheets | 10.0 | 10.0 | 10.0 | 47 | 7 | 27.0 |
| T8-Drying on bare soil surface (farmers practice) | 16.0 | 12.0 | 14.0 | 32 | 8 | 20.0 |
| S.Em ± | 0.52 | 0.86 | 0.45 | 4.82 | 1.31 | 2.13 |
| C. D @ 5% | 1.5 | 2.5 | 1.3 | 14.5 | 3.8 | 6.2 |
| C. V (%) | 8.0 | 8.5 | 8.0 | 11.0 | 6.0 | 11.0 |

Table 3: Effect of drying methods on quality parameters of dry chilli fruits (Two years pooled)

| Treatments | Color (ASTA) | Capsaicin (%) | Oleoresin (%) | Aflatoxin (ppb) |
|---|--------------|---------------|---------------|-----------------|
| T1-Drying in solar tunnel drier | 170 | 0.93 | 7.58 | ND* |
| T2-Drying on cement concrete floor | 204 | 0.93 | 7.58 | |
| T3-Drying on polythene tarpaulin sheet | 154 | 0.93 | 7.58 | |
| T4-Oven drying (control) | 191 | 0.93 | 7.58 | |
| T5-Drying on metal wire mesh | 188 | 0.92 | 6.91 | |
| T6-Drying on surface washed with dung slurry | 179 | 0.92 | 6.91 | |
| T7-Drying on surface of zinc sheets | 193 | 0.92 | 6.91 | |
| T8-Drying on bare soil surface (farmers practice) | 193 | 0.92 | 6.91 | |
| S.Em ± | 20.15 | 0.06 | 0.34 | |
| C. D @ 5% | NS | NS | NS | |
| C. V (%) | 8.5 | 2.3 | 2.8 | |

* ND – Not Detected

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