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# Studies on chemical treatments and drying methods on quality attributes in chilies cv. Tejaswani

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**Abstract**
An experiment was conducted on pungent chili variety Tejaswani to find out the effective chemical treatment and drying method for better quality dry chilies. The result showed that there was significant difference among the drying methods and post-harvest chemical treatments for all the quality parameters except in weight loss during drying (%), pod length (cm) and pod circumference (cm). Oven drying was found to be efficient method as compared to sun and polyhouse drying in time to reach 8-10% moisture, maximum capsaicin (0.82%), less number of wrinkles, with good color development than control. Among the interactions, calcium chloride (2 percent) with oven drying resulted the minimum (5.04%) percent of damaged pods, maximum content of oleoresin (14.55 percent), whereas polyhouse drying with calcium chloride was effective in retention of capsanthin (25556 EOA) than control.

**Keywords:** Chilli chemical treatments, drying methods, pod quality, oleoresins and capsaicin

## Introduction
Chilli (*Capsicum annum* L.) an important spice of India is cultivated in all the states and Union territories of the country is valued mostly for its pungency, coloring matter and oleoresin principles. Capsaicin is used in the preparation of balms, whereas the color extracts (Carotnoid pigments) are used as color addition in food industry, poultry and prawn feed industry. Chilli oleoresin is also used in self-defense sprays which are popular in western countries.
Andhra Pradesh is leading both in area and production contributing on an average of 25% of total area and over 40-50% of total production in the country. IT has a good potential for quality production (3.17 t/ha) which are in turn most suitable for international trade. (CMIE 2007) [1]. Traditionally in south India after harvest the fruits are dried in sun to a moisture content of less than 10percent. These dried chilies are graded, packed in gunny bags for marketing and storage. The chilies before packing in the gunny bags, farmers add little water to the fully dried chili to avoid the brittleness. Then these chilies with moisture packed in the bags goes to storage before they are used. During drying and marketing the chilli pods are heavily infested with microbes and thereby deteriorate the export quality.

## Materials and Methods
The experiment was conducted at Post-Harvest Technology Laboratory, Department of Horticulture, College of Agriculture, Rajendranagar, Hyderabad. The chili variety used in experiment is Tejaswani, which is commercially grown in Khammam, Warangal and Guntur districts. The experiment was laid out in a completely randomized block design with factorial concept with three replications. The chemical treatments consists of 2.0% calcium chloride 0.1% sodium benzoate and untreated control whereas drying methods followed are oven drying, polyhouse and Sun drying as control.
The fresh ripened chilli fruits are dipped in the prepared chemical solutions for 10 minutes and the excess solutions were drained out.
In polyhouse a continuous air inlet of 1 ft width was provided on top side of the poly house along the bottom of the vertical wall for the entry of natural air. Excepting this all other sides of poly house are fairly air tight. Hence natural air entered at one and of polyhouse chimney, which provided suitable condition for drying. The average metrological data recorded during the study in poly house i.e. Wind speed 2.2 km/h, temperature 40.5 °C and relative humidity 30.85%. The oven dryer used for was designed and developed in the division of Agricultural Engineering, IARI, New Delhi. Chilies are spread uniformly in trays and are dried at 50 °C with the airflow rate of 0.019 $m^3$/min. The moisture contents of the chilies were determined after every 2 h till it attained an optimum moisture content of 8-9 percent.

**Results and Discussion**

Among the treatments the data in table 1 revealed that there was no significant influence of chemical treatments and drying methods on weight loss in drying, pod length, pod circumference, due to drying pre-treatment with chemicals and their interactions. It indicates that pod length of chillies is not affected by drying methods and pre-treatment with chemicals. Similar results were reported by joy *et al* (2001) [2] and Papakumari *et al* (2003) [6]. There was significant visual difference with drying methods on pod shape and colour was observed. Oven drying was effective with less number of wrinkles whereas highest in control. Similar results are reported by Mangaraj *et al* (2001) [4], Paliniappan (1997) [7]. According to the standard colour chart, the colour of the pods was deep red in oven drying, Scrlet red (5117) in poly house drying and opaque red (5211) in sun drying.

The data in Table 2 revealed that Oven drying was found to be most efficient method to reduce the time to reach 8-10% moisture in comparison with Sun drying and polyhouse drying. Similar better performance of oven drying was reported by Mangaraj *et al* (2001) [4]. It is interesting to note that there was no significant difference in drying time due to treatment with chemicals indicating that the chemicals used in this investigation have no effect on drying time.

Among the drying methods the percentage of damaged pods was lowest (5.04%) in oven drying with calcium chloride followed by polyhouse drying which were at par and highest percent (11.11) of damaged pods observed in un treated pods at Sun drying. This could be attributed to the efficiency of calcium chloride in the retention of colour and prevention of fading. Similar results of efficient chemicals were reported by Umajyothi *et al*. (2004) [11]. It was interesting to note that there was no difference in percent of damaged pods between the PHD and OD at all the chemical treatments.

Chilli Pods dried in oven drying recorded the maximum content of oleoresin of 12.03 percent which was significantly superior over the other methods of drying with chemical treatments calcium chloride recorded highest oleoresin content (12.82%) over the other treatments. Among the interactions pods treated with calcium chloride (CC) with oven drying (OD) found significantly highest percent (14.55) of oleoresins followed by polyhouse drying (PHD) with the same chemical.

Among the treatments, data in table 3 indicated that the higher percentage of capsaicin was recorded by oven drying (0.82%) which was superior over other drying methods. It could be attributed to uniformity in drying temperature. Similar results were reported by Mini *et al*. (2000) [6]; Mangaraj *et al*. (2001) [4]; Topuz and Ozdemir (2004) [9]. With chemical treatments the maximum capsaicin content was recorded with sodium benzoate (0.82%) than other treatments. The beneficial effect of sodium benzoate 0.1% on the prevention of deterioration in caopsaicin content could be attributed to the interfering mechanism of cell division, permeability of cell membrane and activity of enzymes as explained by Srivastava and Sanjeev kumar, (2002) [8].

Calcium chloride treated pods were dried under polyhouse has resulted significantly higher (25556 EAO colour value) capsanthin than control. It could be due to uniform air circulation of air which helps in maintain the optimum temperature and also protection from UV rays by poly house and also the strong adsorption affinity of capsanthin with adsorbents like calcium compounds as explained by Krishnamurthy and Natarajan (1973) [3].

**Table 1:** Effect of Post-Harvest Chemicals and drying methods on weight loss (%), pod length (cm) and pod circumference (cm) in Chilli cv. Tejaswani

| Drying Methods | Post Harvesting Chemicals | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weight Loss (%) | | | | Pod Length (cm) | | | | Pod Circumference (cm) | | | |
| | Control | CC | SB | Mean | Control | CC | SB | Mean | Control | CC | SB | Mean |
| OYSD | 61.58 | 59.75 | 60.6 | 60.64 | 8.02 | 7.38 | 8.12 | 7.84 | 0.90 | 0.93 | 0.90 | 0.91 |
| PHD | 58.92 | 58.08 | 58.75 | 58.58 | 7.91 | 8.07 | 7.89 | 7.96 | 0.89 | 0.93 | 0.94 | 0.92 |
| OD | 55.83 | 61.85 | 61.25 | 59.64 | 8.04 | 8.14 | 8.05 | 8.08 | 0.89 | 0.92 | 0.90 | 0.90 |
| Mean | 58.77 | 59.89 | 60.2 | | 7.99 | 7.86 | 8.02 | | 0.89 | 0.93 | 0.91 | |
| | SEm + | CD@1% | | | SEm + | CD@1% | | | SEm + | CD@1% | | |
| Chemicals(C) | 0.98 | N.S | | | 0.13 | N.S | | | 0.02 | N.S | | |
| Drying (D) | 0.98 | N.S | | | 0.13 | N.S | | | 0.02 | N.S | | |
| CxD | 1.69 | N.S | | | 0.23 | N.S | | | 0.28 | N.S | | |

OYSD – Open yard Sun Drying; PHD – Polyhouse drying; OD – Oven drying; CC – 2% Calcium Chloride; SB – 0.1% Sodium benzoate

**Table 2:** Effect of Post-Harvest Chemicals and drying methods on Time (h) required to reach 8-10% moisture, percent of damaged (whitened) pods and oleoresin (%) in chilli cv. Tejaswani

| Drying Methods | Post Harvesting Chemicals | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time (h) required to reach 8-10% moisture | | | | Percent of damaged (whitened) pods | | | | Oleoresin (%) | | | |
| | Control | CC | SB | Mean | Control | CC | SB | Mean | Control | CC | SB | Mean |
| OYSD | 56 | 45 | 48 | 50 | 11.11 | 8.41 | 9.61 | 9.71 | 8.83 | 11.46 | 10.91 | 10.40 |
| PHD | 48 | 39 | 44 | 43 | 6.69 | 5.66 | 6.02 | 6.12 | 9.90 | 12.44 | 11.28 | 11.21 |
| OD | 38 | 33 | 36 | 36 | 6.49 | 5.04 | 5.93 | 5.82 | 9.99 | 14.55 | 11.59 | 12.03 |
| Mean | 45 | 39 | 42 | | 8.10 | 6.37 | 7.19 | | 9.60 | 12.82 | 11.26 | |
| | SEm + | CD@1% | | | SEm + | CD@1% | | | SEm + | CD@1% | | |
| Chemicals(C) | 0.52 | N.S | | | 0.14 | 0.41 | | | 0.23 | 0.69 | | |
| Drying (D) | 0.76 | 2.58 | | | 0.14 | 0.41 | | | 0.23 | 0.69 | | |
| CxD | 0.85 | N.S | | | 0.24 | 0.71 | | | 0.40 | 1.19 | | |

OYSD – Open yard Sun Drying; PHD – Polyhouse drying; OD – Oven drying; CC – 2% Calcium Chloride; SB – 0.1% Sodium benzoate

**Table 3:** Effect of Post-Harvest Chemicals and drying methods on Capsaicin (%) and capsanthin (EOA color value) in Chilli cv. Tejaswani

| Drying Methods | Post Harvesting Chemicals | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Capsaicin (%) | | | | Capsanthin (EOA color value) | | | |
| | Control | CC | SB | Mean | Control | CC | SB | Mean |
| OYSD | 0.51 | 0.63 | 0.74 | 0.63 | 18655 | 21902 | 19440 | 19999 |
| PHD | 0.70 | 0.81 | 0.86 | 0.79 | 24178 | 25556 | 23406 | 24380 |
| OD | 0.77 | 0.82 | 0.87 | 0.82 | 22362 | 23673 | 24807 | 23614 |
| Mean | 0.66 | 0.75 | 0.82 | | 21732 | 23711 | 22551 | |
| | SEm + | CD@1% | | | SEm + | CD @ 1% | | |
| Chemicals(C) | 0.015 | 0.045 | | | 186 | 552 | | |
| Drying (D) | 0.015 | 0.045 | | | 186 | 552 | | |
| CxD | 0.026 | N.S | | | 322 | 955 | | |

OYSD – Open yard Sun Drying; PHD – Polyhouse drying; OD – Oven drying; CC – 2% Calcium Chloride; SB – 0.1% Sodium benzoate

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