

A study of improving turmeric processing

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(Received : June, 2008)

Abstract : The study was conducted in the College of Agril. Engg and Technology, M.A.U. Parbhani in 2002-05 to improve the traditional turmeric boiling pot and reduce the losses in quality, time and fuel in turmeric processing. Turmeric boiled in improved boiling pot retained 3.33% essential oils and 2.30% curcumin as against 2.93% and 2.57% respectively in traditional boiling pot. Also it was observed that turmeric rhizomes boiled for 35 minutes in improved pot gave uniform colour than rhizomes boiled for 25 and 45 minutes.

Key words : Curcumin, colour pigment, turmeric

Introduction

India is leading with 90% of turmeric production in the world with 1,37,000 ha of area. Being a spice cash crop, medicinally and industrially important, the area under turmeric is increasing in Maharashtra with a production of 8220 tones of turmeric from 6644 ha of area (www.indianspices.com). Primary processing of turmeric is still being done with traditional means leading to many losses and difficulties. Farmers use open shallow metal (Mild Steel) pan for turmeric boiling. The pan is kept on the furnace and turmeric rhizomes are heaped in. Water is added up to 3/4 of the heap height in the pan and covered by gunny bags or plastered. It takes about 50-60 minutes to boil the water and next 40-45 minutes to cook the turmeric. When the white fume comes out, a small grass or wooden stick is easily pierced through the rhizome. Then it is presumed that turmeric is cooked. With the help of wooden comb with long handle, cooked rhizomes are pulled out of the pan and allowed to leach the water through it. The cooked rhizomes are spread on a clean open ground for drying.

Because of shallow open pan heat losses are more increasing cooking time. More the cooking time more the loss of curcumin and oleoresins will be. Also the traditional handling of cooked rhizomes causes trampling, mudmixing and scorching leading to quality and quantity loss. Hence the study was undertaken in the Department of Agricultural Process Engineering, C.A.E.T., M.A.U., Parbhani in 2002-03 for designing, fabrication and testing of improved turmeric-boiling pot to reduce the losses in turmeric boiling.

Material and methods

Thorough study of traditional turmeric processing in major turmeric producing districts of Maharashtra was carried out. Throughout the state farmers follow the same method with little difference is increasing a number of difficulties and losses.

A laboratory model small capacity insulated turmeric boiling pot with lid and perforated drum (Fig. 1a, 1b) was designed

and fabricated in the Department of Agril. Process Engg. The design details are given in the Table 1. It was the modification in the existing boiling pots used by farmers to reduce the time of boiling, fuel required and the heat loss by conduction and convection. On the periphery of pot 2.5 cm thick layer of glasswool insulation was provided.

The Mild Steel barrel (Fig. 1b) was punched on periphery to make holes of 1cm diameter at 10cm spacing up to 30-cm height of the barrel and 15-cm upper portion was kept intact. The capacity of barrel is 30 kg. After harvesting turmeric rhizomes were made free of soil, washed, roots were cut and filled in the perforated barrel. Then this barrel was lifted with the help of a wooden stick passing through the rings and kept in the boiling pot on the furnace. Then water was filled in the boiling pot up to 3/4 height. Then it was covered with lid to avoid heat losses.

Rhizomes of Rajapuri, Krishna, Selam, Tekurpeta, Barshi turmeric varieties were boiled in the traditional open pan and improved pan for 25, 35, and 45 minutes and spread in the open yard for drying. After drying the samples were polished in the polishing drum. The polished samples were separately filled in the polyethylene bags. After grinding samples were analyzed to find out the percentage of volatile oil and curcumin in the sample. The essential oil content was determined by Clavenger's method and Curcumin content by American Spice Trade Association method.

Results and discussion

From Table 2 it is observed for rhizomes of all turmeric varieties boiled in the improved boiling pot retained 3.33 % of oleoresin and curcumin 3.20 % whereas in traditional pot 2.93% and 2.57 respectively. About 50% loss of volatile matter takes place in boiling and drying. The loss of important essential oils and curcumin percentage is more in the traditional boiling pot than improved boiling pot. It may be because of shallow pan, over cooking of bottom rhizomes, under cooking of upper rhizomes and more time required for cooking. In traditional

Table 1. Design details of the turmeric boiling pot

Boiling pot (Mild Steel)		Perforated barrel (Mild Steel)	
Top diameter of pot	60cm	Diameter	45cm
Bottom diameter of pot	45cm	Height	45cm
Height	45cm	Thickness	0.45 cm.
Thickness	0.45 cm.	Diameter of perforations	1cm
Insulation thickness	2.5cm (Glass wool)	Capacity	30 kg
Diameter of lid	45cm		
Thickness	0.15cm		

Table 2. Effect of improved boiling pot on essential oil and curcumin percentage

Variety	Initial Essential Oil (%)	Essential oil after boiling (%)		Initial curcumin (%)	Curcumin after boiling (%)	
		Traditional boiling pot	Improved boiling pot		Traditional boiling pot	Improved boiling pot
Rajapuri	6.45	2.97	3.90	6.00	2.67	3.50
Tekurpeta	5.90	3.13	3.78	5.50	2.84	3.40
Krishna	5.35	2.76	3.40	5.00	2.57	3.10
Salem	7.58	2.94	3.32	7.20	2.61	3.00
Barshi	6.80	2.83	3.27	6.50	2.13	2.99
Average	6.42	2.93	3.33	6.04	2.57	3.20

method turmeric is boiled for about 50 to 60 minutes, it may lead to the loss of volatile matter. Also boiled turmeric rhizomes are roughly handled, trampled under the feet of workers, which on exposure to sunlight causes more loss of curcumin and oleoresin.

From Table 3 it is observed that the rhizomes of all turmeric varieties boiled in improved pot for 25, 35 and 45 minutes were under cooked, properly cooked and over cooked respectively. In insulated turmeric boiling pot heat is properly conducted with minimum loss to the atmosphere. But boiling for 25 minutes is insufficient and for 45 minutes is more than sufficient causing under cooking and over cooking of turmeric. Also the colour of the rhizomes of all varieties boiled for 25, 35 and 45 minutes was not uniform, uniform yellow and faint yellow respectively. Turmeric boiled for 25 minutes was under cooked hence the colour remained concentrated in the center of the dried rhizome without spreading uniformly throughout the endosperm and the outer ring looks faint i.e. non-uniform yellow colour observed. Turmeric boiled for 35 minutes shows uniform yellow colour. Turmeric boiled for 45 minutes shows little faint colour throughout the endosperm of rhizome because of more time of boiling.

From Table.4 it is observed for all the turmeric varieties that higher percentage of essential oils and curcumin is retained

in the rhizomes boiled for 25 minutes than those boiled for 35 and 45 minutes. Rhizomes boiled for 45 minutes shows less content of essential oils and curcumin than those boiled for 25 and 35 minutes. The cooking of rhizomes reduces essential oils and curcumin and that to boiling for more time depletes the percentage of quality components of turmeric. Higher percentage of essential oil and curcumin is retained in the rhizomes boiled for less time (25 min.) but colouring pigment curcumin is not spread uniformly throughout the endosperm and it shows non uniform colour and hence it is not preferred by the buyers in the market. In the view of colour percentage retaining and uniformity in yellow colour turmeric boiling for 35 minutes could be better.

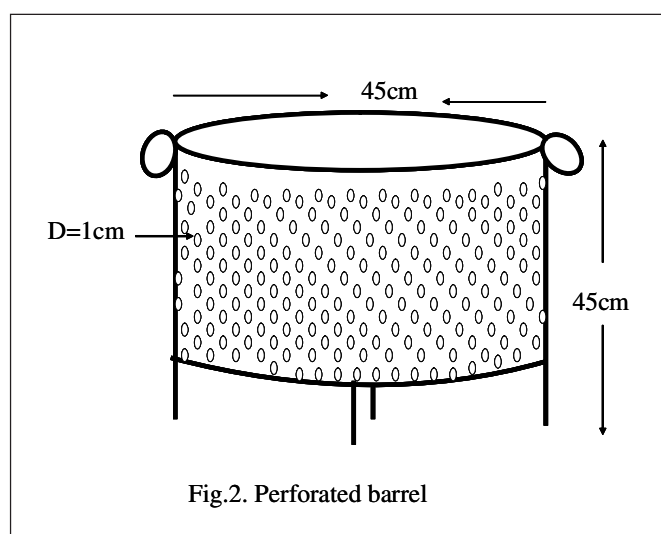
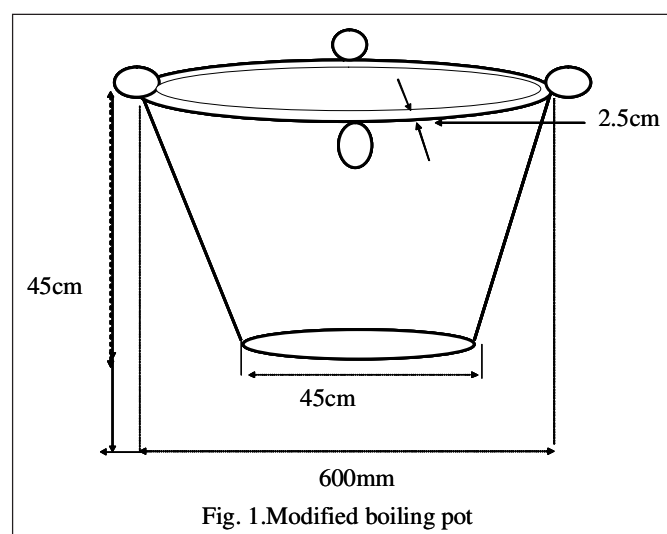
After analyzing the results obtained by boiling different turmeric varieties in traditional and improved boiling pots as per the treatments, following conclusions were drawn: Turmeric boiled in improved boiling pot for 35 minutes gives uniform yellow colour to the dried product. Turmeric boiled for 35 minutes in improved boiling pot reduces the loss in time, quality and fuel compared to traditional boiling and retains higher percentage of essential oil and curcumin than traditional boiling pot.

Table 3. Effect of time of boiling on cooking quality of turmeric

Time of cooking minutes	Cooking quality	Colour uniformity
25	Under cooked	Not uniform Yellow
35	Properly cooked	Uniform Yellow
45	Over cooked	Faint yellow

Table 4. Effect of boiling time on essential oil and curcumin percentage

Variety	Essential oil			Curcumin (Absorbance at 425 nm)		
	Time of cooking, (minutes)					
	25	35	45	25	35	45
Rajapuri	6.45	3.90	3.55	6.00	3.50	3.2
Tekurpeta	5.90	3.78	3.15	5.50	3.40	2.9
Krishna	5.35	3.40	2.78	5.00	3.10	2.5
Salem	7.58	3.32	3.10	7.20	3.00	2.8
Barshi	6.80	3.27	2.05	6.50	2.99	1.8
Average	6.42	3.53	2.93	6.04	3.20	2.64



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